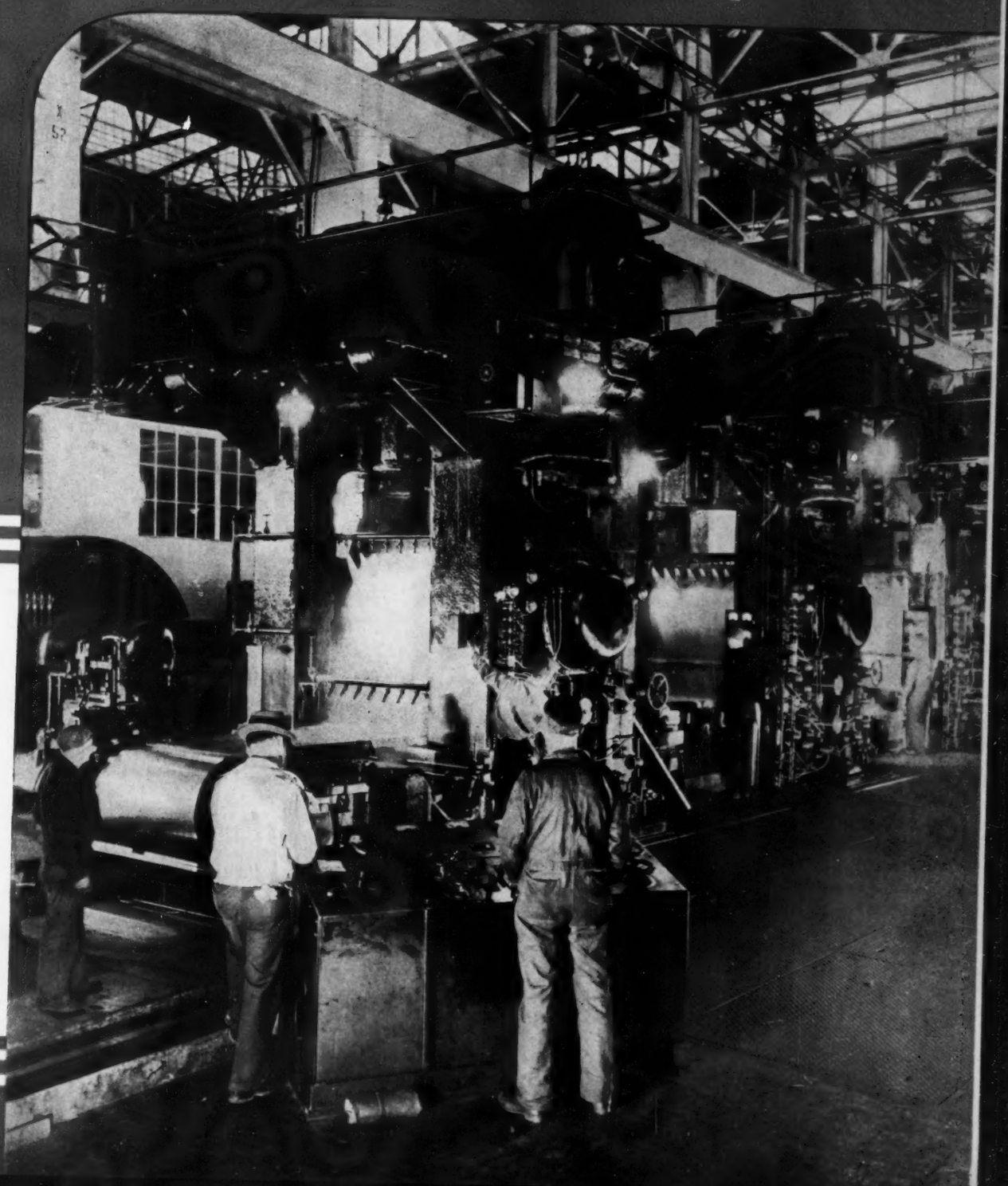
OCTOBER 10, 1936

ELECTRICAL WORLD

McGRAW-HILL PUBLISHING COMPANY, INC., NEW YORK CI... NTS PER COPY

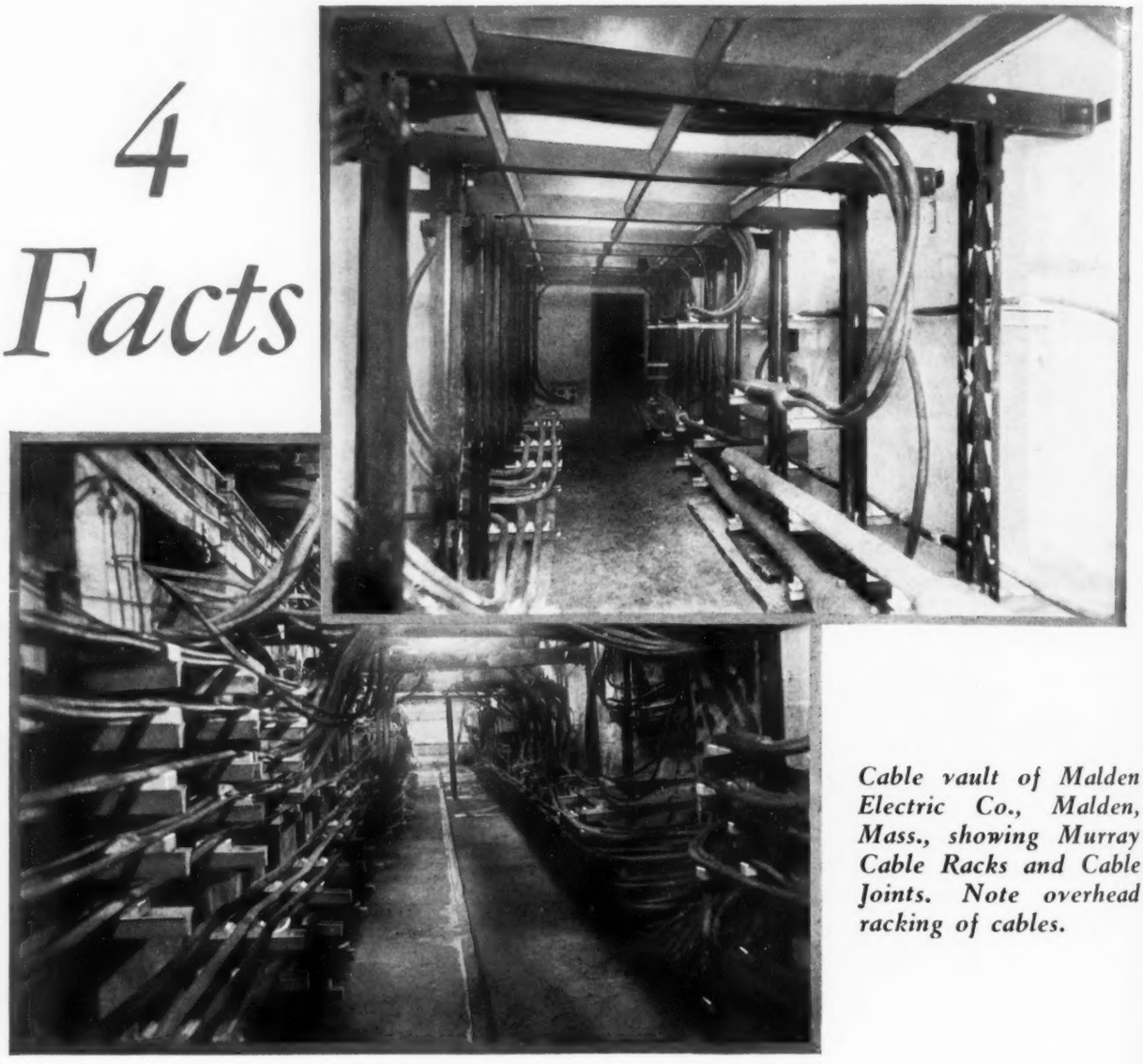
UNIVERSITY OF MICHIGAN
LIBRARY
ANN ARBOR MICH



MILLIONS FOR STEEL STRIP MILLS

...ar has witnessed the in-...n of many new electri-...ld strip mills in the steel ... These afford the latest ...es in electrical controls, ...ation and materi... hand-... A three-stand mi... of the ...otor Company i... hown.

4 *Facts*



Cable vault of Malden Electric Co., Malden, Mass., showing Murray Cable Racks and Cable Joints. Note overhead racking of cables.

About the MURRAY CABLE RACK

1. Protective
Porcelain insulation is a barrier against spread of stray currents on cable sheath thru medium of rack. Smooth surface for cable movement.

2. Adaptable
Cables need not be placed in set or fixed position. Rack may be mounted on ceilings—grooved arm allows for adjustment of cable position.

3. Durable
Made of steel—hot dip galvanized—porcelain pillow for cable to rest on—a heavy duty rack—will provide long life—is dependable.

4. Easy to Install
Two bolts put a stanchion in place. To change arm size merely raise arm out of notch and insert one required. Parts made to suit "special" jobs.

METROPOLITAN DEVICE CORP'N, Brooklyn, N. Y.

Metropolitan Device Corporation
1250 Atlantic Avenue
Brooklyn, N. Y.

Please send, without obligation, 12-page illustration booklet of *Murray Cable Racks.*

Name .....
Title .....
Company .....
Address .....

ELECTRICAL WORLD

FOUNDED IN 1874 ✦ ✦ READ BY ELECTRICAL MEN FOR 62 YEARS

HOWARD EHRLICH, Vice-President

A. E. KNOWLTON, Associate Editor · EARL WHITEHORNE, Associate Editor · H. G. DOOLEY, Associate Editor · L. W. W. MORROW, Editor · G. F. WITTIG, Statistical Editor · FRANK R. INNES, Western Editor · H. S. KNOWLTON, New England Editor

PAUL WOOTON, Washington Correspondent · W. K. BEARD, JR., Manager · D. T. BRAYMER, Assistant Editor · C. W. LEIHY, Pacific Coast Editor

Coming Features

Industrial Modernization

In a special section of the October 24 issue ELECTRICAL WORLD will present a report on industrial modernization that will show how up-to-date electrical production tools are being used to cut costs, boost production and promote efficiency in industry today.

Telemetering Scheme for Intercompany Ties

Details of a practical scheme for remote metering on intercompany ties located 100 to 200 miles from the dispatcher's office are soon to appear in a feature story by E. E. George, Tennessee Electric Power Company.

Rent and Income Fix Appliance Market

Sherman H. Hall of Brooklyn Edison soon will present a correlation of several surveys that show how consumer economic status may prevent response to blind rate reduction.

Arc Furnaces vs. Cupola

In a coming article data will be presented that will permit comparing costs of arc furnaces and cupola melting. The author discusses the economic application of these essential foundry tools.

CONTENTS

OCTOBER 10, 1936

Economic Aspects of Grand Coulee 39

Longwood Towers Adopts Electric Kitchen 42

Lighting Service Pays 45

Dayton Tells the Farmer and Gets Him 47

Draft Tube Design Improved by Model Studies 48

Superposition Turbine Going Into Fisk Street 52

Power Sales Swell Output 55

Carter Field on Washington Events 58

Editorials	37 and 56	Men of the Industry	88
Operating Practices	71	New Equipment	96
Power at Work	74	Recent Rate Changes	108
Engineering Ideas	78	Municipal Items	111
Building Up the Load	84	Sales Opportunities	113

NEWS OF THE WEEK . . . . . *Page 60*

VOLUME 106 . . . NUMBER 41

Contents Copyrighted, 1936, by McGraw-Hill Publishing Company, Inc.

ELECTRICAL WORLD—Published every Saturday. Price 25 cents a copy. Subscription rates: United States, Canada, Mexico, Central and South American countries, $4 a year; all other countries, $6 or 24 shillings a year. Application for entry as second-class matter at Albany, N. Y., pending. Printed in U.S.A.

Branch Offices: 520 North Michigan Ave., Chicago; 883 Mission St., San Francisco; Aldwych House, Aldwych, London, W.C. 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta, Ga.

McGRAW-HILL PUBLISHING COMPANY, INC.

Publication Office: 99-129 North Broadway, Albany, N. Y.

Editorial and Executive Offices: 330 W. 42d Street, New York, N. Y.

JAMES H. McGRAW, JR., Chairman · MALCOLM MUIR, President · JAMES H. McGRAW, Honorary Chairman

HOWARD EHRLICH, Vice-President · B. R. PUTNAM, Treasurer · D. C. McGRAW, Secretary

Cable Address: MCGRAWHILL, New York. Member A.B.P. Member A.B.C.

OKOLITE INSULATION

Effectively RESISTANT TO

HEAT	MOISTURE	CORONA

OKOLITE insulation permits the use of higher voltages — higher loadings. Not requiring a lead sheath, it avoids the wiping of joints, the effects of electrolysis and corrosion, sheath losses, and other disadvantages of lead.

OKOLITE is a high-voltage cable insulation developed upon extensive research — and backed with an impressive performance record. It has the resiliency and other desirable mechanical characteristics of rubber insulation. It is particularly resistant to heat, moisture and corona.

OKOLITE insulation is suitable for many classes of power cable. Its scope runs from a small control wire to a heavy generator lead—or a submarine power cable.

OKOLITE insulation is particularly adaptable for braided cables in wet ducts—or where there are high temperatures.

OKONITE

THE OKONITE COMPANY

Founded 1878
and
HAZARD INSULATED WIRE WORKS DIVISION
THE OKONITE-CALLENDER CABLE COMPANY, INC.

EXECUTIVE OFFICE: PASSAIC, N. J.

New York, Philadelphia, Los Angeles, Boston, Pittsburgh, Seattle, Buffalo, Chicago, Washington, Dallas, Detroit, San Francisco, Atlanta

Factories: Passaic, N. J., Wilkes-Barre, Pa., Paterson, N. J.

OKONITE QUALITY CANNOT BE WRITTEN INTO A SPECIFICATION

ELECTRICAL WORLD

OCTOBER 10, 1936

Peace or War on Federal Power

President Roosevelt does unexpected things. His call for a power conference in Washington last week was an unexpected reversal in policy and a face-value conciliatory gesture to private utilities. The invitation was cordial, the reception smiling and the conference group reputable and representative.

Aside from the official statement, the meeting was shrouded in secrecy. It is understood that two basic proposals were made in general terms. The first was that some plan for pooling power in the T.V.A. be developed and the second was that in the meantime the T.V.A.-Commonwealth & Southern contract be extended. These proposals were looked upon as an olive branch, although discounted as largely political in purpose.

T.V.A. faces a fact and not a theory. It has about 180,000 kw. of firm power and transmission lines are built or building to Knoxville, Chattanooga, Memphis and other cities. It has encouraged several municipalities to vote to build competing distribution systems and supported their applications for federal money.

But with November 3 this contract expires. T.V.A. would thereafter have power, but no market. Litigation promised to hold up the possibility for selling power for many months, if at all. What would the public say to an enormous investment, wasted water power and no place to sell it? It is apparent that T.V.A. officials and the President do not relish the political repercussions that would follow. Hence the conference.

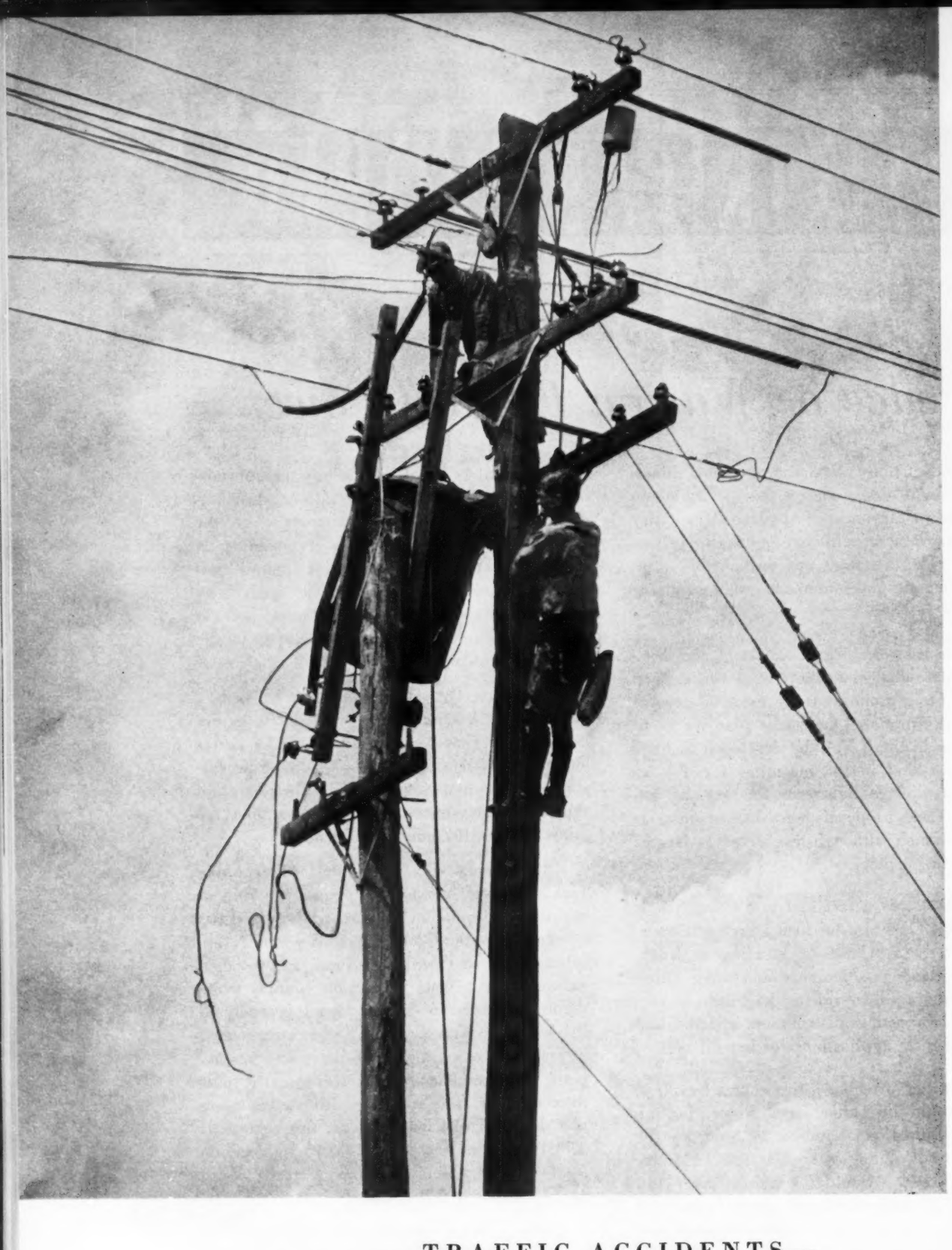
It is known that the Federal Power Commission welcomed the conference as permitting it to introduce its basic plan for regional power integration. This essential plan for the T.V.A. area embodies a joint board composed of representatives of private and public utilities to take over all regional generation and transmission and to wholesale power to local distributing agencies. This is a compromise on the entire government ownership regional plan often put out from Washington, but it undoubtedly seeks to secure majority control by the federal and municipal representatives. It leaves to each community to decide upon public or private ownership.

What can private utilities say to such a proposal? A "no" on the T.V.A. situation means more chaos and uncertainty. An agreement to negotiate at least shows a tacit acceptance of the plan, even though there are no tangible commitments. In the meantime the court cases will come to a decision.

Consistency is a rare jewel! This whole idea of federal bureau control or ownership of regional transmission and generating facilities re-establishes the holding company under another name and with far more power than existed with private ownership holding companies. It assumes the functional necessity of the holding company, but places management in the hands of political appointees and bureaucrats. It puts dictation at the top. It puts these men far away from the ultimate consumer and the local distributors. Yet this scheme is called good and the private enterprise development of expert holding company management and operation is called bad.

The political playboys of power and the amateur experts are facing some embarrassing situations now that their works come into being. We predict that the more the works near completion the more embarrassing the conditions will become.

Editor.



TRAFFIC ACCIDENTS—

What an automobile does to a transformer pole

Economic Aspects of Grand Coulee

By HENRY EARLE RIGGS
Honorary Professor of Civil Engineering, University of Michigan

Some Questions:

Why is Grand Coulee being built?
What need will it satisfy?
Will it be a self-supporting project?
Where will its power find a market?
What does it mean to the power industry?
Is it needed for irrigation?
Is it economically sound?

GRAND COULEE project in northeastern Washington is the largest of the great public works of the New Deal. It is an undertaking on a truly grand scale. The dam will be the largest masonry structure ever built by human hands. It will contain more than 11,000,000 cu. yd. of concrete. The irrigation system involves the building of the world's largest pumping plant, with a capacity to lift 16,000 cu.ft. of water per second against a head of more than 300 ft. The various technical magazines have had many articles on the physical aspects of Grand Coulee and of the splendid construction methods and progress of the work, therefore no description of these is necessary here.

The writer has no criticism of the construction plans. The past work of the Bureau of Reclamation is assurance that they are good. He has nothing but praise for the splendid work of the contractors. But he has made some study of this project and believes that there are other aspects of it that need to be discussed.

Army engineers study the Columbia River

An act of Congress passed on March 3, 1925, provided for "The formulaton of general plans for the most effective improvement of the river for the purposes of navigation and the prosecution of such improvement, in combination with the most efficient development of the potential water power, the control of floods and the needs of irrigation."

In pursuance of those purposes, the Rivers and Harbors Act of 1927 approved House Document No. 308, 69th Congress, 1st Session, which provided for a survey of the Columbia River and a report. The survey was made and the report completed in 1932. The report is House Document No. 103, 73d Congress, 1st Session, dated March 29, 1932. It was referred to the committee on rivers and harbors on June 10, 1933. This is a two-volume, 1,945-page, comprehensive report on navigation, irrigation and power on the entire Columbia River in the United States.

These data were available in the autumn of 1933, when the New Deal was seeking projects for immediate construction in order to put men to work. It undoubtedly was referred to in the selection of Grand Coulee and Bonneville, as these were two of the ten sites discussed in the report. But apparently nobody studied the report, or, if they did, paid any attenton to it, because *the report, as will be shown, does not recommend this project.*

Grand Coulee was started as a power yardstick

Public Works Administration allotted not to exceed $63,000,000 to build a low dam at this site and establish a power plant, which was to be one of the President's "yardsticks." Just why he picked Washington, the state with the lowest rates, the highest consumption and a very large percentage of municipally owned plants—and those the best of the lot—is hard to understand. Just why this location in the desert, remote from the larger markets of the area excepting only Spokane, was selected is also a mystery. But it was selected, plans hastily got out for a low dam, work commenced at once, and in July of 1934 a contract was let.

As soon as Grand Coulee was approved Oregon demanded its share of public expenditures, politics and policy got in their work, and within a few weeks the Bonneville project was approved, an appropriation made for surveys at that site, and ten days later $20,000,000 was allocated to Bonneville for construction.

The building of Bonneville Dam will extend deep water navigation to The Dalles, 50 miles further up river, but navigation would only justify building the locks and contributing a small amount, not to exceed $5,000,000, toward the cost of the dam. No irrigation is needed. Therefore Bonneville became a power project which had the favorable characteristics of low unit investment and accessibility to market, being only 40 miles from Portland.

Grand Coulee shifted from "yardstick" to irrigation

In the months following commencement of work at Bonneville somebody evidently woke up to the fact that the Administration was engaged in building two "yardsticks" in the same territory. For months the engineers were discussing changes of plan at Grand Coulee. From the time of the awarding of the contract on July 16, 1934, until June of 1935 studies were in progress and rumors were rife that changes of plan would be made. On June 5, 1935, the official order was issued for a most sweeping change. Instead of the low dam and power house as originally planned, the contract was changed to that of building the foundations for a high dam. Excavation quantities were increased more than 3,000,000 yd., mass concrete more than 850,000 yd., and metal more than 50,000,000 lb. in excess of

the original contract. The story of these changes is told by Kenneth M. Keener in *Engineering News*, issue of August 1, 1935. Mr. Keener is senior engineer of the Bureau of Reclamation and his words are authoritative.

This change in plan involved the adoption of the Columbia Basin Irrigation scheme as the justification for Grand Coulee and committed the United States to a project which had been long under discussion and the cost of which had been estimated by the Corps of Engineers in House Document No. 103, 73d Congress, previously referred to. This estimate is (Page 15 — H. Doc. 103):

Total investment for power	$204,483,453
Navigation facilities	11,000,000
Investment for irrigation, Columbia Basin	221,721,880
Total	$437,205,333

The P.W.A. allocation of $63,000,000 has, therefore, grown into a $450,000,000 project by bureau action and apparently without direct action of Congress.

Board of Engineers of Rivers and Harbors makes a report

The report of this board on the entire Columbia River development as published in House Document No. 103, previously referred to, specifically cites three of the suggested dams, Warrendale (Bonneville), The Dalles and Grand Coulee, as of special interest and says: "Full power development at any one of the three should properly defer power development at the others until the growth of the power market justifies further development."

In its recommendations the board says of Grand Coulee:

> Local interest . . . is centered in the Columbia Basin project, which involves the construction of a dam for the development of a large amount of power at the Grand Coulee site, and the irrigation of a very large tract of land by pumping from the river. The economic feasibility of the plan is largely based on subsidizing irrigation by profits from the sale of power. The board expresses no opinion on the wisdom of this policy, . . . The economic feasibility is also dependent upon the future growth of power demand over a period of years. This is a question involving many uncertain factors and obviously impossible of exact determination. The board does not undertake to make a definite prediction, but is of the opinion that the estimates of the reporting officers that the growth in power demand will be such that the entire prime output would be absorbed in a period of fifteen years . . . is unduly optimistic . . . The board accepts the views of the Secretary and is unable to recommend the adoption of the project at the present time.

The foregoing reference to "the Secretary" directs attention to a communication dated January 30, 1932, from Arthur M. Hyde, then Secretary of Agriculture, which is published on pages 538 to 564 of this report and is a scathing condemnation of this project for many sound reasons, only one of which will here be cited:

> It is proposed to have the federal government spend $400,000,000 to bring 1,200,000 acres into production. That figures down to a construction cost of more than $333 per acre.
>
> To that basic cost of $333 per acre the settler must add the cost of the land (90 per cent of the land in the project is privately owned), the cost of leveling, ditching and draining, and of buildings, equipment and live stock. If, before he adds all these up, he looks around him, he will see an average valuation for farm land and buildings of $57.17 in Washington, $38.12 in Oregon, $11.81 in Montana and $44.64 in Idaho, according to the 1930 Census. Even if the average valuation per acre in Washington were double the present figure, the per acre cost of the Columbia Basin project, however it may be figured, must remain grotesquely uneconomic. (House Doc. 103, page 539.)

Bureau of Reclamation against immediate construction

On pages 484 and 485 of the first volume of this report will be found the conclusions of the Bureau of Reclamation on Grand Coulee:

> 9. No construction on the Columbia River Dam and power plant should be undertaken until contracts are executed for the sale of power which will insure sufficient revenue for annual expenses and the repayment of the investment in the dam and power plant with interest at four per cent within fifty years.
>
> 10. No construction on the irrigation development should be undertaken until the power revenues are assured and a suitable contract for repayment of the investment in irrigation works within forty years has been executed by the district.

When the project was started, in 1933, there were no power contracts made and apparently no positive information as to any definite possible market.

Grand Coulee is primarily a power project

Grand Coulee is therefore a power project. More than that, it is a power project which must sell all of its firm power at a price high enough to subsidize an irrigation project which will cost hundreds of millions of dollars that obviously cannot be collected from the farmers who settle the land.

It would require a complete issue of ELECTRICAL WORLD to present all of the arguments in House Document 103 against the irrigation project. The New Deal had this information and these highly adverse reports in September and October of 1933, when these two projects were hastily adopted and work started, and the arguments were just as strong then as they are today. In a letter from the late Elwood Mead, Commissioner of Reclamation to Major-General Brown, Chief of Engineers of the U. S. Army, dated March 19, 1932, it was stated: "It will require at least ten years after the works are authorized to build the dam and the power plant, and another ten or fifteen years to absorb the power thus made available. These things must precede the large expenditure to build the works required for irrigation." Thus, we have started on a long, long trail of spending, a trail which leads to inevitable failure.

The Army Engineers' estimate of construction cost of the power plant in somewhat more detail is as follows (see page 64, H. Doc. 103):

Dam and reservoir	$138,736,160
Power house and machinery	32,450,617
Total construction	$171,186,777
Carrying charges	33,296,676
Total investment	$204,483,453
Annual Charges	
Operation and maintenance	$151,758
Depreciation	665,239
Interest	8,099,338
Amortization	2,147,076
Total	$11,063,411
Prime output per year (kw.-hr.)	7,945,000,000
Cost per kilowatt-hour (mills)	1.40

Data given to visitors at the dam state that firm power of 7,000,000,000 kw.-hr. per year will be produced. Other competent authorities place the output of firm power at 7,500,000,000 kw.-hr.

For purpose of this discussion, 7,500,000,000 kw.-hr. is a fair average figure.

No market for the power

Both Grand Coulee and Bonneville are necessarily limited to the power market in the States of Washington, Oregon and Idaho.

Reliable figures of the capacity of these two "yardsticks," assuming the construction of both Bonneville and high dam whose foundations are being put in at Grand Coulee, are as follows:

	Bonneville	Grand Coulee	Total
Final installed capacity (kw.-hr.)	432,000	1,890,000	2,322,000
Firm energy (thousands of kw.-hr.)	2,700,000	7,500,000	10,200,000
Secondary energy (thousands of kw.-hr.)	1,480,000	2,400,000	3,800,000

Ultimately a market for 10,200,000,000 kw.-hr. per year must be found. Let us look at the statistics of the tributary territory. The Federal Census of Electric Utilities of 1932 gives data as follows:

	Rated Generator Cap. (kw.)	Current Generated (kw.-hr.)	Current Sold (kw.-hr.)
Wash.	882,541	2,544,766,928	1,835,963,325
Ore.	382,429	968,614,120	742,723,495
Idaho	208,007	473,289,670	296,091,257
Total	1,472,977	3,986,670,718	2,874,778,077

Those figures for 1932 are too low as the Rock Island plant on the Columbia River and the initial development of the Diablo plant on the Skagit River with other smaller plants have been added since.

Electrical West in its issue of February, 1935, divides the territory into three marketing areas, as follows:

	Installed Capacity (Kw.)	Output Available 1,000 Kw.-Hr.	System Capacity Factor, Per Cent
Puget Sound market area	598,000	2,360,000	0 45
Lower Columbia market area	310,000	1,305,000	0.48
Eastern Washington market area (including northern Idaho)	204,000	930,000	0 52
Total	1,112,000	4,595,000	0.47

The same authority gives further data as to net use of power, surplus power and surplus capacity, total for the three market areas, as follows:

	Condition in 1933	Condition on Return of Peak Load
Net Use (1,000 kw.-hr.)	2,792,000	3,333,000
Surplus (1,000 kw.-hr.)	1,803,000	1,262,000
Surplus capacity (kw.)	440,000	307,000

These figures do not include the projects then under construction and since completed, and they failed to include figures for the Eugene municipal plant and Washington Gas & Electric Company, so that, taking into account all existing and newly completed plants, there is surplus capacity at present of 470,000 kw.

Nor is this all. Existing plants whose initial development made provision for the addition of further units at a low investment cost per kilowatt are listed in detail in *Electrical West*. Five commercial utility companies, 488,000 kw.; the city of Tacoma, 27,000 kw., and the city of Seattle, 666,000 kw., make the impressive total of 1,181,000 kw. capable of ready development.

A study of all of the available statistics indicates that these three areas which must furnish the market for the federal plants are well served and have ample present capacity. The power sales have shown a steady increase at fair rates, and adequate provision has been made for greater generating capacity when needed. The lower Columbia or Bonneville area is rapidly approaching the point where added capacity will be needed. These systems have interconnections with those to the south and with the Puget Sound area, but it seems reasonable to assume that if Congress makes rules and regulations for the sale of Bonneville power which will provide for the sale to utilities there will be a market for a substantial block of power as soon as the initial 86,400 kw. is put in operation in 1937 or 1938.

Presumably there is no need for government going into competition with private business unless there is a need for service which private industry cannot meet, or unless rates are excessive and cannot be controlled by regulatory bodies. To a rank outsider looking into the territory it would appear that the State of Washington needed no help in this respect. With two of the largest and best municipal utilities in the country, one of which has the lowest rates of any in the land, and with the private companies giving the lowest rates in the United States, this would seem the last state in the Union for the federal government to enter.

A study of the data in Rate Series No. 3 of the Federal Power Commission seems to prove this. From Table VIII on page 23 of this document the following data as to the seven states with the lowest average residential rates have been abstracted:

Average Revenue per Kw.-Hr. and Annual Consumption per Customer for Residential Service — 1933

State	Av. Revenue per Kw.-Hr. Cents	Rank—Low to High	Av. Annual Consumption per Customer Kw.-Hr.	National Rank — High to Low
Washington	2.7	1	1,104	1
Oregon	3.0	2	1,047	3
Idaho	3.5	3	1,082	2
California	4.3	4	675	10
Michigan	4.3	4	642	12
Maryland	4.7	5	698	5
Montana	4.7	5	697	7

Analysis of the statistics for 1932 of the Federal Census of Electric Utilities shows the following figures:

Domestic Service

	Revenue per Kw.-Hr. Private Utilities	Revenue per Kw.-Hr. Municipal Utilities	Kw.-Hr. per Customer Private Utilities	Kw.-Hr. per Customer Municipal Utilities
Washington	2.8	2.5	1,214	1,207
Oregon	3.3	2.8	978	1,382
Idaho	3.6	3.2	1,124	1,499
Av. for U. S.	5.6	4.7	600	708

Commercial Service

	Revenue per Kw.-Hr. Private Utilities	Revenue per Kw.-Hr. Municipal Utilities	Kw.-Hr. per Customer Private Utilities	Kw.-Hr. per Customer Municipal Utilities
Washington	2.3	1.3	7,955	10,610
Oregon	2.5	2.9	7,014	4,021
Idaho	3.8	2.1	3,940	6,620
Av. for U. S.	4.3	2.6	3,286	5,190

When it is remembered that the more than 1,800 municipal plants only generate 5.2 per cent of all the energy in the United States and that more than 50 per cent of that is produced by a dozen plants, it will be obvious that Washington, with more than a third of the total energy of the state produced by municipal plants, really does not need the New Deal to show it the way.

Again these figures must be equated for the difference in taxes. The Federal Power Commission shows (Rate Series, 5, pp. 34 and 35):

	Taxes % of Gross Revenue 1933	Taxes % of Gross Revenue 1934	Taxes % of Base Revenue 1933	Taxes % of Base Revenue 1934
Washington	10.9	13.9	12.3	14.9
Oregon	17.0	16.9	17.7	17.7
Idaho	24.4	25.4	28.1	26.0

While Seattle is showing increasing percentages of taxes up to 5.5 per cent gross in 1935 and Tacoma is paying taxes of the order of 10 per cent, the great majority of municipal plants throughout the country pay little or nothing.

Grand Coulee has no economic justification

The foregoing statistics give a sketchy outline of the market area for these two plants. Certainly no private money could be induced to enter the field in competition with the present power-producing agencies.

Facilities ample to produce *ten billion kilowatt-hours a year* in a territory that has a peak load market for three and a third billion. Total installed capacity of 2,322,000 kw. to serve an area that now has half as much installed and has a surplus of power sufficent to do the business of the area for the next several years, and with provisions for additional units to be installed at operating plants that will double the capacity.

The fantastic nature of the project is evident when we recall that the

[*Continued on page* 100]

Longwood Towers Adopts Electric Kitchens

View of Longwood Towers

Electric Range Service Included in Rentals — 241 Apartments Changed From Gas to Electricity Without Delay or Complaint by Tenants — Service-Entrance Cable Used in Interior Runs

THE progressive management of New England's most noted apartment hotel recently announced the completed installation of no less than 241 electric ranges and the same number of electric refrigerators superseding gas cooking and a central cooling plant at the Brookline group of buildings served by the Boston Edison Company in this outstanding residential district. The hotel's refrigerating plant had been in service more than ten years and the gas ranges in the apartments were getting old. An extended study of these services by the management led to the decision that installation of electric ranges would provide clean, cool and convenient kitchen conditions for the most exacting tenant, and that operating economy would be effected by equipping each suite with a separate electric refrigerator. It was found that the change could be made with careful planning and execution in such a way that the tenants would suffer little inconvenience. It worked out this way, and in no instance was it necessary to suspend apartment cooking operations more than one day; in fact, some tenants found their range operation stopped for only one meal. Use of service-entrance cable played a vital part in this rapid transformation, which was accomplished without a single complaint on the part of the tenants of Longwood Towers.

Three eight-story buildings of great architectural beauty comprise this hotel. It was essential to make the change from gas to electricity without damaging the interior of any apartment or incurring undue expense for wiring. Use of rigid conduit would have increased the outlay by nearly $10,000 and was prohibitive. Flexible metallic conduit would have been prohibited by the Brookline town authorities for this purpose, and so the contractor for the electric range wiring and installation, the Gaston Electric Company of Boston, utilized type "SCF" three-conductor Anaconda service-entrance cable between the terminal boxes in the basements and the individual range receptacles. These cables were run upward through the 4-in. ver-

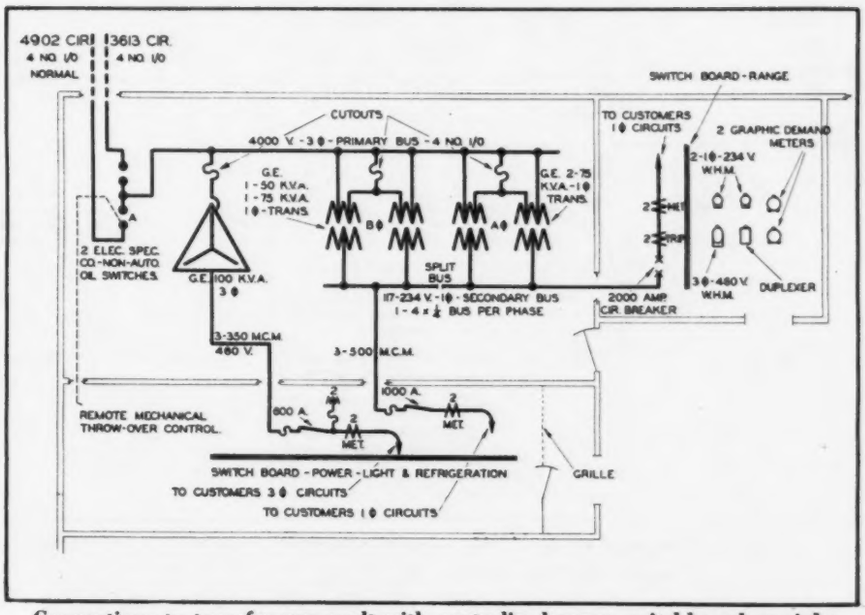
We have recently completed installation of new General Electric ranges and refrigerators . . . Kitchen problems touch but lightly those who make a home at Longwood Towers . . . but this splendid equipment makes preparation of occasional home-cooked meals a pleasure . . . and serves as an index of our determination to provide always the finest and best for our patrons.

—Longwood Towers Company.

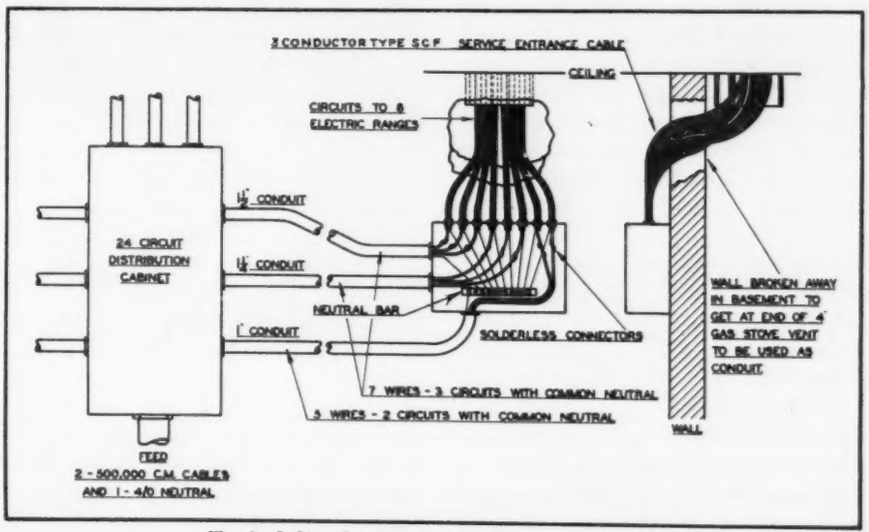
tical vent pipes formerly utilized to carry away the fumes from the gas ranges, and the scheme avoided cutting into floors and annoying the tenants besides being economical to the last degree. During the height of the changeover eight electric ranges were connected every other day. About 12,000 ft. of Anaconda cable was installed in toto.

The range installation consists of 233 outfits rated at 6,900 watts and eight units that are rated at 8,500 watts each. The total range load connected is 1,678 kw. The Boston Edison Company's experience indicated that the installation could be made on the basis of an increase of but 0.6 kw. per range in the demand, and the transformer capacity installed for the ranges was therefore fixed at 150 kva., and as a convenient size, two 75-kva. transformers were provided. The last range was installed on June 5, and during the period between May 20 and June 24 the maximum demand from the ranges was 52 kw. It is expected that in the fall and winter this demand will be increased as tenants resort more and more to home cooking. Energy for cooking in each suite is not metered individually, but a charge is made in the apartment rent to cover this. The total energy consumed in cooking is metered, along with the demand of the group, at a central switchboard in the basement of one of the hotel buildings. Electricity used for suite refrigeration, lighting and other services than cooking is metered and billed to the tenants by the management.

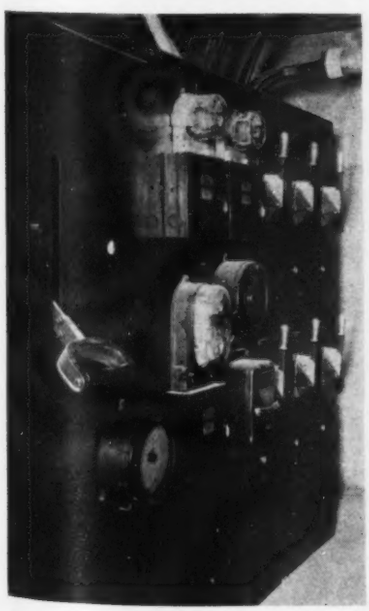
In modernizing the suites the hotel

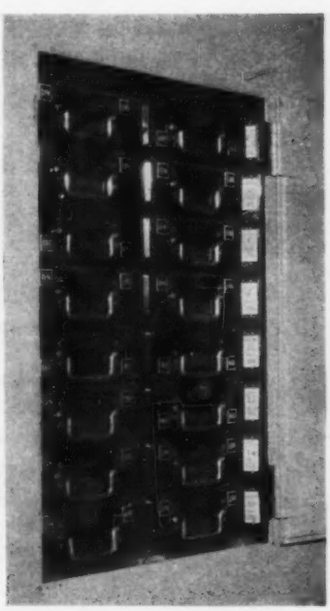

4902 CIR. 4 NO. 1/0 NORMAL
3613 CIR. 4 NO. 1/0
SWITCH BOARD - RANGE
CUTOUTS
4000 V. - 3 ϕ - PRIMARY BUS - 4 NO. 1/0
TO CUSTOMERS 1 ϕ CIRCUITS
2 GRAPHIC DEMAND METERS
2-1ϕ-234 V. W.H.M.
G.E. 1 - 50 K.V.A. 1 - 75 K.V.A. 1ϕ - TRANS.
G.E. 2-75 K.V.A.-1ϕ TRANS.
2 ELEC. SPEC. CO.-NON-AUTO. OIL SWITCHES
G.E. 100 K.V.A. 3 ϕ
SPLIT BUS
117-234 V.-1ϕ - SECONDARY BUS 1 - 4 x 1/4 BUS PER PHASE
2000 AMP CIR. BREAKER
3ϕ-480 V. W.H.M.
DUPLEXER
3-350 M.C.M. 480 V.
3-500 M.C.M.
REMOTE MECHANICAL THROW-OVER CONTROL
800 A.
1000 A.
MET.
SWITCH BOARD - POWER - LIGHT & REFRIGERATION
GRILLE
TO CUSTOMERS 3 ϕ CIRCUITS
TO CUSTOMERS 1 ϕ CIRCUITS

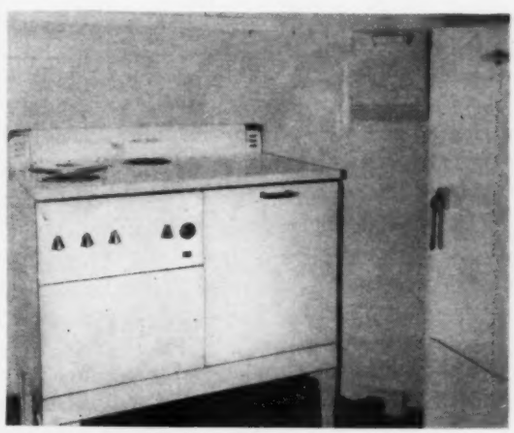
Connections to transformer vault with centralized range switchboard at right


3 CONDUCTOR TYPE S.C.F. SERVICE ENTRANCE CABLE
CEILING
CIRCUITS TO 8 ELECTRIC RANGES
1/2" CONDUIT
1/2" CONDUIT
1" CONDUIT
24 CIRCUIT DISTRIBUTION CABINET
NEUTRAL BAR
SOLDERLESS CONNECTORS
WALL BROKEN AWAY IN BASEMENT TO GET AT END OF 4" GAS STOVE VENT TO BE USED AS CONDUIT
7 WIRES - 3 CIRCUITS WITH COMMON NEUTRAL
5 WIRES - 2 CIRCUITS WITH COMMON NEUTRAL
WALL
FEED 2 - 500,000 C.M. CABLES AND 1 - 4/0 NEUTRAL

Typical distribution center for range circuits

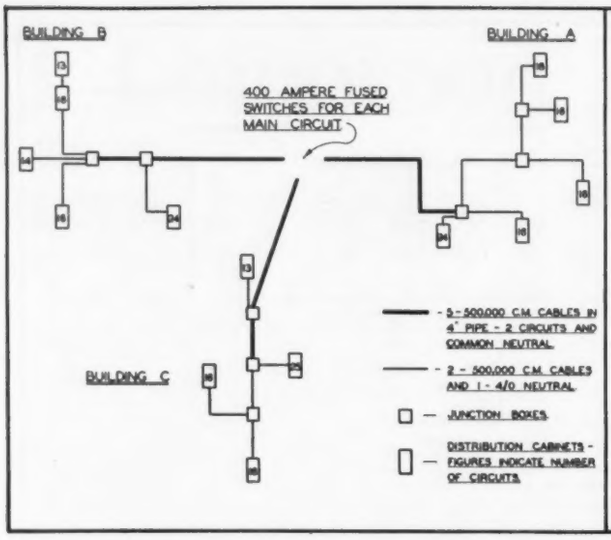




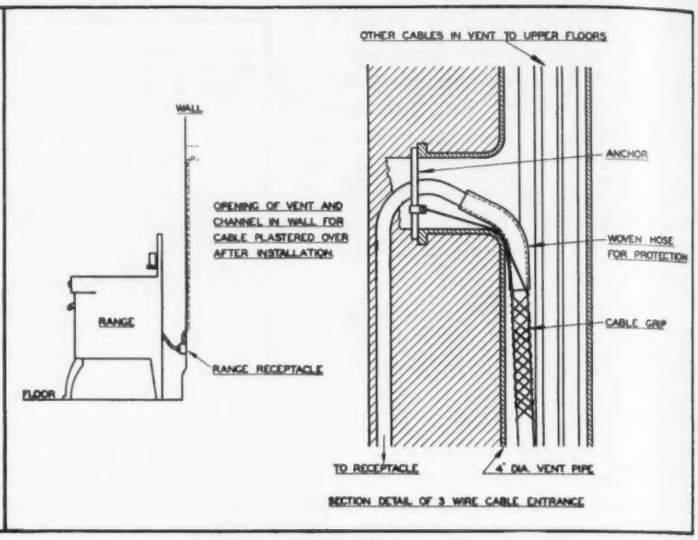


Typical apartment range installed

Left — Metering and control board for all apartment ranges. Right — Typical dead-front distribution cabinet controlling and fusing individual range circuits, one per apartment


BUILDING B
BUILDING A
400 AMPERE FUSED SWITCHES FOR EACH MAIN CIRCUIT
BUILDING C
- 3 - 500,000 C.M. CABLES IN 4" PIPE - 2 CIRCUITS AND COMMON NEUTRAL
- 2 - 500,000 C.M. CABLES AND 1 - 4/0 NEUTRAL
— JUNCTION BOXES
— DISTRIBUTION CABINETS - FIGURES INDICATE NUMBER OF CIRCUITS

Layout of internal feeders from range board to distribution centers



Method of entering kitchen from former gas range vent pipe

transformer vault was arranged as shown, with one switchboard for power, light, refrigeration and miscellaneous uses and another for range service. Two Edison cables feed the hotel, one being held as a reserve with remote mechanical throw-over control for the non-automatic oil switches in the feeder circuits. These cables supply 4,000-volt energy from three-phase, four-wire primaries to transformer banks aggregating 225 kva. and delivering energy for miscellaneous service at 460, 117 and 234 volts as indicated.

The range service is protected by a 2,000-amp. circuit breaker at the basement switchboard, and here 400-amp. fused switches control the main circuits running to the three Towers buildings "A," "B" and "C." All the range supply from the secondaries of the step-down transformers serving this load through to every individual kitchen is single phase. Two graphic demand meters have been installed on the range service to provide data for checking the performance of the system during the coming months.

The main circuits feeding the three buildings for range service are made up of 500,000-circ.mil cables run in 4-in. conduit, each supply consisting of two two-wire circuits and a common neutral terminating in conveniently located junction boxes in the basements. From these junction boxes in general two 500,000-circ.mil cables and one No. 4/0 neutral are run in conduit to distribution cabinets of the Trumbull dead-front type set flush in the basement walls. From 13 to 24 apartments are normally served from an individual cabinet. From each distribution cabinet two-wire circuits and common neutrals are run in conduit to terminal boxes near the lower ends of the former gas stove vent pipes. The neutrals are connected to a copper busbar in each box as shown.

As the phase conductors open out in the terminal box they are attached to the Anaconda cable phase conductors by Burndy solderless connectors, and the inclosing neutrals of the Anaconda are tapped into the neutral bar in the terminal box. Service-entrance cables are then carried up through the vent pipes to the required floor, being held by Kellems grip as shown and carried into the suites through the T's formerly used for gas range exhaust service. The right-angled turn of the cable at the T is protected by a short length of woven rubber hose, and the cable is led into the kitchen to the range receptacle, where it terminates in a 1½-in. square metal clamp.

The first four floors are served by No. 8 A.W.G. circuits, the four upper floors being served by circuits made up of a No. 8 neutral and two No. 6 phase conductors. There are 8,000 ft. of No. 6 and 4,000 ft. of No. 8 cable in service. This cable reached a test of 4,600 volts between neutral and water ground in the Edison company laboratory before breakdown. The ranges are provided with 115-volt coils in the hot-plate units and 230-volt oven coils. The service-entrance cable with the grounded neutral of course provides for these two voltages by connecting across the phase wires for the higher potential and between phase wire and neutral for the lower voltage. Each range is fused at 30 amp. in the basement panel box, all connections between the range receptacle and the Trumbull cabinets being solid.

NO QUARREL IF HONEST

It is perfectly clear that if a pooling agreement is achieved by the President's committee, the idea of the T.V.A. as a yardstick will be discarded, at least so far as the transmission and distribution of current are concerned. . . ., the yardstick area should be as strictly an experiment as is an experimental farm. If the objective of those in charge of the power yardstick is to conduct a series of honest and scientific experiments, no one can reasonably quarrel with them. If their objective is to show that private ownership is undesirable, the whole project will be perverted.—From "The ABC of the T.V.A.," by Raymond Moley in *Today* of October 3.

Lighting Service Pays

Tangible Data From Philadelphia—No Merchandising Done by Specialists—Cost 82 Cents per Dollar of Revenue—Survey Supports Conclusions

By

G. BERTRAM REGAR

Manager Lighting Sales Department, Philadelphia Electric Company

DURING the twelve months ended August 31, 1936, the home-lighting girls of the Philadelphia Electric Company were responsible for the addition of 1,847.6 kw. of new lighting load on the system. The total cost of this activity, including overhead, management, travel, rent and direct expenses, amounted to $45,375. On an incremental basis of $30 per kilowatt the estimated added annual revenue from this business was $55,428. This gives a unit cost of 82 cents per dollar of added revenue. These results give an answer to the question, Does home-lighting promotion pay?

Our home-lighting specialists do not sell lamp bulbs, portable lamps or lighting equipment. They call on individual homes and promote the advantages of good lighting in the home through the use of the sight-light meter and the home-lighting demonstration kit. They make definite lighting recommendations which are given to the customers in writing, a copy of which is retained in our own files. Call-backs are made for the purpose of checking the additional load actually installed as the result of these recommendations, and in numerous cases for the purpose of extending the service to other parts of the home not always covered in the first call. In no case is added load taken credit for without its being inspected.

Home-lighting work was started by us five years ago with two girls, and through the experience gained in this period the organization has been built gradually so that mistakes could be rectified and developments made with a minimum of expenses.

As a consequence of this careful development and a study of the results obtained last year we commenced this fall's activity on September 1 with a total feminine personnel of 33, as compared to 25 one year ago. The present personnel consists of a supervisor, four group leaders and 28 field specialists.

In the light of experience, home-lighting has been established on a September 1 to August 31 basis. The summer is a comparatively dull sales period, and these months are used to augment and improve the organization by the addition of new girls and the training of them.

The question of personnel turnover is a problem that must be faced. In our experience it has been caused by failure of girls to measure up to our standard, of the procurement of positions with higher remuneration, and illness. In the period from September 1, 1935, to August 31, 1936, six losses were sustained, as compared to seven for the previous twelve months.

Replacement and additions of personnel entail a cost of training and a lapse of two or three months before the new advisers are producing on a paying basis. This naturally affects the aggregate cost per dollar of added revenue. Despite this fact, the cost has dropped from $1.05 for the year ended August, 1935, to the present cost of 82 cents, and it is fully expected that with a larger force it will be lower in the coming year. Replacement of girls lost after February 1 each year is not made until the 15th of the following August.

The salary range is from $85 to $110 per month. All new girls are started at the lower figure and advancement is dependent upon the individual's work and the results obtained. The new girls are given two weeks of intensive training in lighting service, including lectures, case studies and trial demonstrations. Those who survive the training go into the field for an additional two weeks accompanied by a group leader. They are then ready for individual work. This timing of employment and the method of training puts into the field a full and competent crew of girls at the start of the eight-month lighting service season, and, in the event of turnover, results in a minimum crew at the beginning of the dull lighting season.

In the twelve months ended August 31, 1935, the girl-months of work totaled 226, resulting in an average of 98 kw. of increased business per girl per year. It must not be construed, in analyzing the following figures, that 226 girl-months represent a definite number of calendar days. Saturdays are devoted to necessary clerical work and meetings. Sickness, vacations, leave time and inclement weather take their toll. The number of days in the above period actually devoted to contacting customers, both for the purpose of making demonstrations and the necessary call-backs, amounted to 4,075.

The following statistics on the past year's operation are compiled from the daily activity reports:

Total days of contacting customers	4,075
Total demonstrations made	6,238
Total cases resuling in load increases	5,251
Total load installed, kilowatts	1,847.6
Average increased load installed per customer	351 watts
Percentage of load installed to load recommended	48.3
Percentage of demonstrations given to customers contacted	34.3
Average demonstrations per day per girl	1.53
Average increase per girl per day, watts	452

As previously stated, while the value of a home-lighting activity depends primarily on additional load and procuring it efficiently, the deciding factor in the eyes of the management is the amount of increased revenue to the company.

With this thought in view, a detailed check survey was made on this activity to supplement the system records given above. Each of the five division managers of the Philadelphia Electric Company was asked to select at random an appreciable number of his domestic customers who had installed better lighting between February 1 and September 30, 1935, as a result of the recommendations of one of our home-lighting specialists.

The energy use and revenue of this group of customers was then compiled for the four winter months of 1934, or before the changes were made, with the corresponding months of 1935 with the improved lighting installed.

For the system as a whole there were 329 cases studied. Of these, 242 customers showed increases in energy use, 79 showed decreases and eight were unchanged. The resultant effect for the total group of customers was equivalent to an increase of 18.5 kw.-hr. per month in energy use per customer for each of the four months.

Despite the expressions of satisfaction from our customers personally to our lighting specialists and the many letters of appreciation received by us, we investigated further to ascertain if the advantages of better lighting were permanent. Especially was this desirable because of the decreased use of energy in the cases of 79 of these customers. Supervisors were assigned to the duty of investigation.

In not a single instance was there a complaint against the company or the cost of lighting. The decreases came about because of changes in home conditions. Some were amusing, but all were logical. In general, they were caused by children leaving home to go to college or being married; by illness and deaths, even divorces, sudden business reverses with the necessity to economize. These conditions brought about, as can readily be seen, a reduction of rooms in use and less entertaining being done.

Although convinced of the soundness of our home-lighting service, we felt that other factors might have affected the trend of domestic use of energy. Therefore another check was needed. Consequently, each division manager was requested to furnish a list of the customers living next door or adjacent to those having made the changes, but who themselves had not been called upon by a home-lighting specialist. The energy use for the same comparable months was compared, and of these 329 neighbor customers, 203 showed increased use and 126 showed decreased use over the 1934 months.

The aggregate result showed an average increase in energy use of 4.7 kw.-hr. per month for each of the four months.

Thus, for the period considered, *the net gain in energy use per month for the four months by those customers on whom lighting specialists had called was* 13.8 *kw.-hr. per customer.*

Detail variations in divisions

It is interesting to note the variation in the survey data found in each of these divisions. These regions have geographic separation and are of different industrial and residential types.

Delaware Division—Total cases 30, of which 22 showed increases and eight decreases. Average increase per month in the cases that increased was 28.8 kw.-hr. In the homes that decreased use the average loss was 13.8 kw.-hr. per month. The total equivalent effect for the group was an increase of 17.4 kw.-hr. per month per customer.

Next-door customer cases on which no lighting service calls were made were 30. Of these, 21 showed increases, the average being 18.6 kw.-hr. per month. Nine cases showed a loss, the average being 8.3 kw.-hr. per month. The total equivalent effect was an increase of 10.5 kw.-hr. per month per customer.

Schuylkill Division—Total cases 56, of which 46 increased and ten decreased. Average increase was 32 kw.-hr. per month per customer. Average decrease was 9.2 kw.-hr. The total equivalent effect was an increase of 24.6 kw.-hr. per customer per month.

Next-door neighbor cases totaled 56, of which 37 increased and 19 decreased. Average increase was 11.7 kw.-hr. per month. Average decrease was 7.9 kw.-hr. per month, the total effect giving an increase of 5.1 kw.-hr. per month per customer.

Eastern Division—Total cases 60, of which 47 increased and thirteen decreased. Average increase was 34.2 kw.-hr. per month. Average decrease was 14 kw.-hr. per month. The total equivalent effect was an increase of 23.7 kw.-hr. per customer per month.

Next-door neighbor cases were 60, of which 38 showed increases and 22 showed decreases. Average increase was 19.7 kw.-hr. per month and average decrease was 28.8 kw.-hr. per month. The total equivalent result was an increase of 1.9 kw.-hr. per customer per month.

Main Line Division—Total cases 34, of which 25 increased and nine decreased. Average increase was 34.6 kw.-hr. per month. Average decrease was 23.2 kw.-hr. per month. The total equivalent effect was an increase of 19.3 kw.-hr. per customer per month.

Next-door neighbor cases were also 34, of which 23 increased and eleven decreased. Average increase was 23.0 kw.-hr. and average decrease was 22.2 kw.-hr. The total equivalent result was an increase of 8.3 kw.-hr. per customer per month.

All Suburban Divisions—Total home service cases were 180, of which 140 showed increases and 40 showed decreases. Average increase was 32.6 kw.-hr. per month. Average decrease was 14.8 kw.-hr. per month. The total effect was an increase of 22.1 kw.-hr. per month.

Next-door customers tested were 180, of which 119 showed increases and 61 decreases. Average increase was 17.6 kw.-hr. per month. Average decrease was 18 kw.-hr. per month. The total equivalent effect was an increase of 5.6 kw.-hr. per month per customer.

Philadelphia Division—Total cases 149, of which 110 increased and 39 decreased. Average increase per month per customer was 22.3 kw.-hr. Average decrease was 9.3 kw.-hr. The total equivalent result was an increase of 14.1 kw.-hr. per month per customer.

Next-door neighbor cases were 149, of which 84 showed increases and 65 decreases. Average increase per customer per month was 12.4 kw.-hr. Average decrease was 7.8 kw.-hr. The total equivalent effect was an average increase of 3.6 kw.-hr. per month per customer.

All results check

These data on the effect of the home-lighting service increasing load are convincing. The homes called upon, as a whole, had a 14.4 per cent increase in energy consumed as contrasted to 4.4 per cent for the comparable homes which had not had home-lighting demonstrations, and we firmly believe that this thorough investigation fully sustains the economic value of the home-lighting service. In addition to the tangible results, there is an important asset in improved public relations to be recorded. These girls were cordially received and made a good impression for themselves and for the company.

From the total system results which were sustained by the survey, it is obvious that home-lighting service pays. It would be profitable to expand the program as rapidly as personnel could be trained and the de-

[*Continued on page* 106]

Dayton Tells the Farmer— and Gets Him

By HOWARD EGBERT
Public Relations Manager
Dayton Power & Light Company

ELECTRICITY aids the DAIRYMAN . . .
Electricity Serves the Farm Home
OUR PLAN
rural customers
Our Plan
On the farm, particularly, there was a time when woman's work was never done. Thanks to electricity, that needn't be true today. Whether it be cooking the family meals, pumping water, churning butter or cleaning the house, electricity can do the work, once done by hand, more satisfactorily, more quickly, more economically than before.
By furnishing a dependable electric supply, we are now helping the women in

Dayton's Rural Electrification Plan

- **You get electric service with no investment except for wiring your property and for appliances.**
- **Convenient and liberal terms for financing payment for wiring and appliances, if you desire.**
- **You agree to use a minimum amount of service per month for a period of four (4) years.**
- **You know in advance exactly what it will cost you, and that service will be dependable.**

TODAY approximately 45 per cent of the rural sections (fourteen counties) which constitute the Dayton Power & Light Company territory in southern Ohio enjoy electric service under the most favorable conditions.

Throughout the nation the proportion of electrified farms to all farms is only 11 per cent, and in the State of Ohio the proportion is 22 per cent. The record of the Dayton company is four times the national and twice the state rural electrification figures.

In 1934 506 rural customers were added. During 1935 more than 1,100 new customers were added. By the first of January, 1937, the company expects to have at least 52 per cent of the rural customers in its territory supplied by dependable electric service. Today there are more than 6,700 rural electric customers on the system. Twelve rural representatives of the company are actively associated with the farming communities in the territory. Many of these representatives were born and reared on farms. The majority of them are graduates of agricultural colleges.

The Dayton Power & Light Company program proceeded through its commercial department and its engineering divisions on the theory that there was no line of demarcation between the urban dweller and the suburban resident.

In order to stimulate the use of electric service in the rural sections and to bring a message that would offer ample assurance to the farm and the farmer, the company inaugurated an educational advertising campaign. Photographs were taken at the very place that electric service was being used. Drawings were taboo in these advertisements. It was not a question of what an artist might think of how electric service could be employed. It was proposed to show actual pictures of how it was employed. This advertising campaign was extensively pursued in all sections of the territory, and it was supplemented by visits made by the rural sales representatives.

Draft Tube Design Improved by Model Studies

Slow-Motion Picture Analysis of Flow in Transparent Plastic Models — Efficiency Gains — New Design Theory for Adjustable Blade Turbines

By HOWARD L. COOPER

Associate Engineer, U. S. Engineer Department, Bonneville Project, Portland, Ore.

DRAFT TUBES contribute several advantages to the technique of hydro-electric generation. First, the draft tube permits the turbine to be placed above the tailwater elevation. Second, it reduces the velocity of the water entering the tailrace. Third, this reduction in velocity adds to the power and efficiency of the turbine in regained velocity head. For the adjustable blade type of turbines specified for the Bonneville, Ore., project, now being constructed by the U. S. Army Engineers, it was estimated that approximately 27 per cent of the power of the wheel was in the water entering the draft tube.

From investigations made on models designed and tested under the direction of Prof. Charles A. Mockmore, head of the civil engineering department of Oregon State College, in the laboratories of that institution, valuable engineering data were obtained. The success of this work led to a decision by Lieut.-Col. C. F. Williams of the U. S. Army Engineers to investigate the possibilities for efficiency gain through improved draft tube design for the Bonneville project, the study to be a continuation of the methods developed at O.S.C.

After making a detailed study of the design already built and tested and combining the features of other types of draft tubes, eight new designs were completed and detailed in the engineering department. These designs form the basis for test models. Draft tube models were completely made of pyralin, most of them being divided into three sections: the vertical leg, elbow and horizontal leg. In order to make some of the complicated changes wooden bowls were made (see Fig. 2), between which the pyralin could be formed. These bowls, being the exact shape of the draft tubes, were clamped together after inserting pyralin between the two forms. The assembly then was placed in a large electric oven and heated to approximately 200 deg. F. Then the two forms were gradually pulled together by large clamps around the exterior, this operation taking approximately 30 minutes to form completely the pyralin sheet. The sheet was then allowed to cool before removing the clamps.

This method of forming the model draft tubes gave excellent results, in some cases the models being within 1/32 of an inch of correct dimensions. After the various features were formed they were trimmed and cemented together, the ends of each section being reinforced with 1/4 in. black pyralin flanges. The flanges not only simplified the assembly of the complex shapes but helped to reinforce the tube against hydrostatic pressure. All of the sections, where it was desirable to make plastic contour studies, were made with a series of 1/2-in. tubes secured to the outer side. A solution consisting of small pieces of pyralin dissolved in a chemically pure acetone made an excellent cement for fastening the various pieces together. In case the surface of the model became powdered or scratched it could be brushed or dipped in a solution of equal parts of butyl alcohol and butyl acetate and denatured alcohol, which would restore it to original clearness. Use of transparent pyralin for the draft tube models facilitated observation of hydraulic flows resulting from various load conditions on the model turbine.

This second article by the author describes the interesting model investigations made by the U. S. Army Engineers in connection with the draft tube design for the 60,000-hp. Bonneville turbine units. The complete story on the Bonneville project will be presented in "Electrical World" at an early date.

How modify elbow draft tube?

As a draft tube in the form of a vertical cone having approximately a 7-deg. angle of flare is the most efficient type developed to date, this design was used as a standard of comparison. Application of this particular design for practical purposes, however, is almost impossible due to the excessive and costly excavation. The design usually used in commercial practice is the elbow draft tube, which has been popular in the past few years because it gives very good efficiencies at a low construction cost.

The object of the investigations described herein was to determine what modifications, if any, could be incorporated in the elbow type of draft tube to improve its efficiency and to obtain engineering data upon which to base future designs.

If it were possible to allow the water to pass around the elbow without the tendency of the water to form two opposite spirals the draft tube design would be less complicated. It is further complicated by the whirling component of the water as it leaves the runner, which may be in either direction, depending upon the load conditions. This reversal of whirling component is more prevalent in Francis type and fixed blade propeller type runners. The flow leaving the automatic adjustable propeller runner, commonly known as the Kaplan type, always rotates with a forward component. Complications of draft tube designs would be considerably simplified if this forward component was reduced to the theoretical angle of discharge. Under certain conditions of load and blade angle this forward component may be as high as 50 deg. This energy is not entirely lost as it is regained in velocity head. The largest losses that can be attributed to the high angle of whirl are the hydraulic friction and the impact on the various walls and piers of the draft tube.

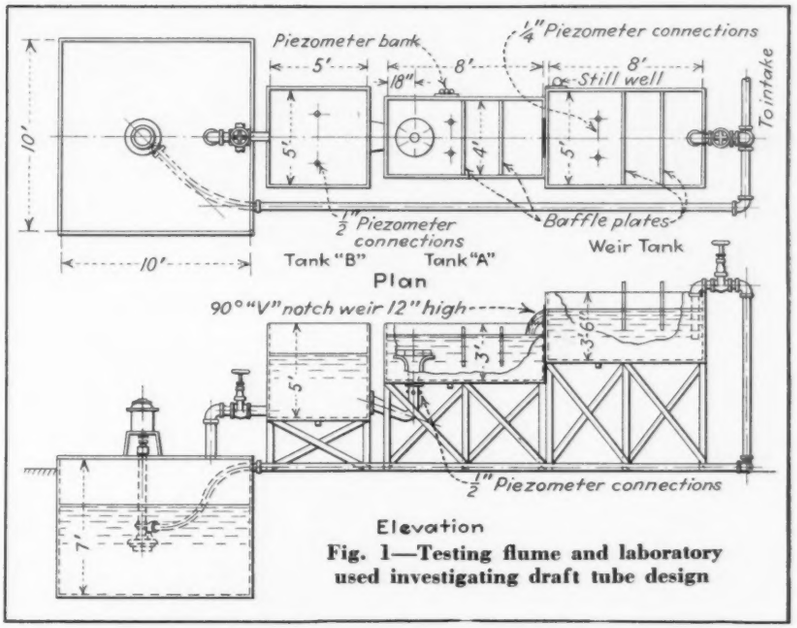


Fig. 1—Testing flume and laboratory used investigating draft tube design

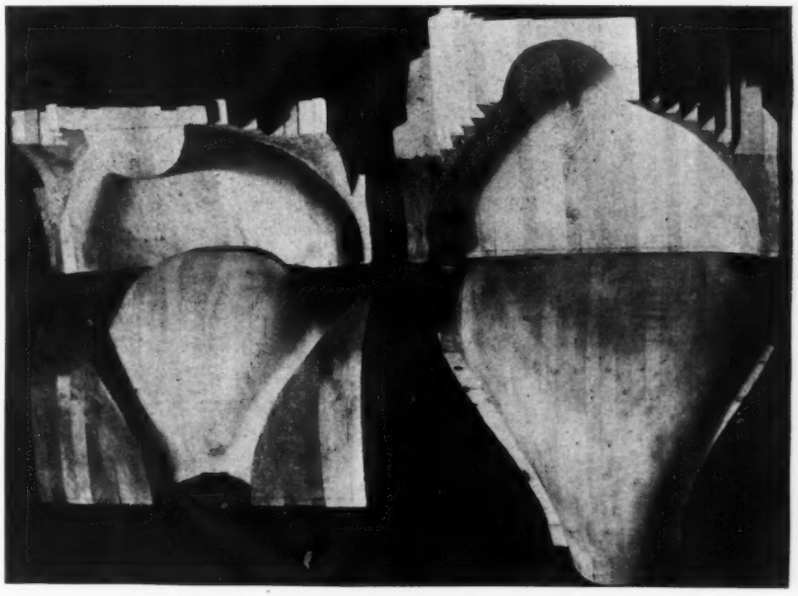


Fig. 2—Forms mold transparent plastic into one section of model draft tube

Fan-shaped principle incorporated

The spiral flow conditions of the water as it passes around the elbow of the common elbow tube will force the water toward one side, causing a relatively high velocity in one side of the horizontal leg and a comparatively slow velocity in the other side. However, under some load conditions the flow may be evenly distributed in the horizontal leg, and under unusual conditions there may be an actual reversal of flow in one side of the draft tube exit.

The natural tendency of a stream of water making a 90-deg. bend onto a flat surface is to flatten out in a very thin fan-shaped jet. Theoretically, if it was possible literally to fold this fan-shaped jet up and over from the outside we would have a nearly perfect method of conducting water around a bend. The water would be following its natural tendency and only hydraulic skin friction would resist the flow. In order to do this on a full-sized turbine would be extremely expensive and the center-to-center spacing of the units would be prohibitive.

This fan-shaped principle was incorporated in No. 1 draft tube (see Fig. 3). Instead of making the water passages very small to accommodate this thin, fan-shaped jet the center spacing of units was limited to a normal economical figure and it was attempted to collect the outside of the jet in a bulbous-shaped elbow and horizontal leg. By depressing the roof of the elbow it was possible to conduct the water into the horizontal leg very smoothly, but in doing so the velocity near the outer sides was increased and it was not possible to decelerate uniformly within the economical length of draft tube. The regions of high velocity along the sides continued to the exit, and in the center and upper parts of the horizontal leg there was an actual reversal of flow. Many minor alterations were made in an attempt to correct this fault, but with little success. In the final analysis it was evident that the theory was fundamentally correct, but practically was impossible of attainment in actual practice. This theory was combined with two other types of draft tubes, all three giving approximately the same results.

The second general principle used to straighten the whirling component in the vertical leg was the installation of vertical and horizontal splitters. One particular type closely resembled the European splitter tube (see Fig.

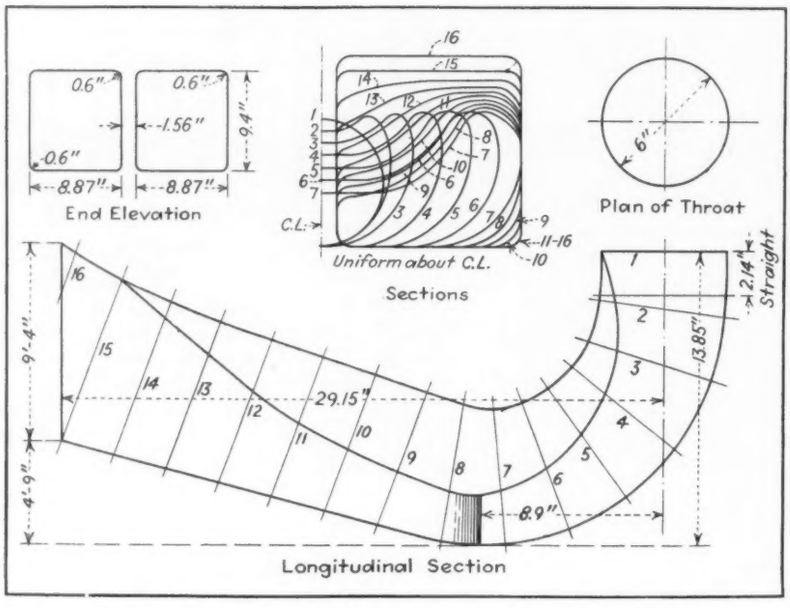


Fig. 3—Model draft tube similar to design used in the Bonneville power house

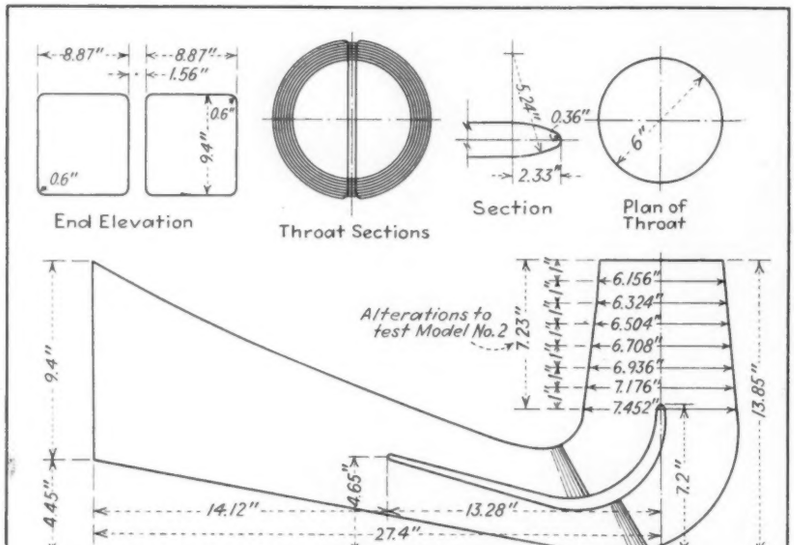


Fig. 4—Another experimental draft tube model which showed promising results

4). This design gave very high efficiency for straight flow and small angles of whirl, but the efficiencies dropped rather rapidly when the turbine commenced to develop the higher loads with large blade angles. It was at this particular part of the testing program that slow-motion-picture studies of the internal flow within the transparent draft tubes were begun. This particular model gave excellent proof of the value of slow-motion-picture studies. When this tube was operating at a high angle of whirl very little disturbance could be detected with the naked eye. The pictures that were made of this elbow showed conclusively that there were many eddy losses, particularly around the leading edge of the splitter. Efficiency was raised several per cent by the removal of the horizontal splitter and the installation of one more vertical splitter in the horizontal leg.

The pictures also showed that this extra splitter straightened the flow in the horizontal leg by not permitting the regions of high velocity to be forced against the extreme outside of the horizontal leg.

Several modifications were made of the horizontal splitter type tube. In lengthening the distance from the runner to the splitter efficiencies were increased for the larger angles of whirl. In all cases where the horizontal splitter was used the velocity contours at the exit showed comparatively few regions of high velocity.

Horizontal splitter adopted

The draft tube to be used on the Bonneville turbines was the horizontal splitter type which had been developed by the engineering staff of the S. Morgan Smith Company. In this tube were incorporated the best principles of the splitter type applied to a very efficient elbow-type draft tube. Considerable experimenting was done to determine the best location of the splitter and its action when subjected to heavy load conditions and large blade angles. There is no doubt that this is one of the most efficient draft tubes ever developed for a low-head Kaplan turbine.

The next series of draft tubes were developed along entirely different principles originated by the author. This design is adaptable only to Kaplan type turbines as it is necessary for perfect operation that the water rotate at all times in one direction. The theory of this design is based on a fundamental centrifugal principle; that water rotating in a body tends to distribute its energy throughout the entire 360 deg. The application of this principle as applied to draft tube design is as follows:

The rotating body of water leaving the runner passes into a bulbous-shaped vertical leg having equal and diametrically opposite lobes. It was decided that two lobes would meet the requirements in a draft tube instead of four. As the water rotates down the vertical leg the lobes gradually retard the whirling action and by the time the water reaches the horizontal leg the flow is practically uniform and free of high velocity areas. A test was made on this tube by allowing the water to enter at approximately 50-deg. whirling component. Under this condition the capacity of each of the horizontal leg channels was measured. Within the limits of accuracy of the method used in determining the quantity no difference could be detected between the two channels. It made no difference whether the whirling component was 1 deg. or 50 deg. Lack of time did

not permit the running of a complete set of tests on this particular design. By the changing of the rate of deceleration at the various sections and slight alterations of the inside and outside radii of the elbow the efficiency would no doubt be increased considerably. It could be seen from the slow-motion pictures that the above-mentioned alterations would be a decided improvement. The efficiencies shown on tests of this strictly theoretical model were as high as any tested.

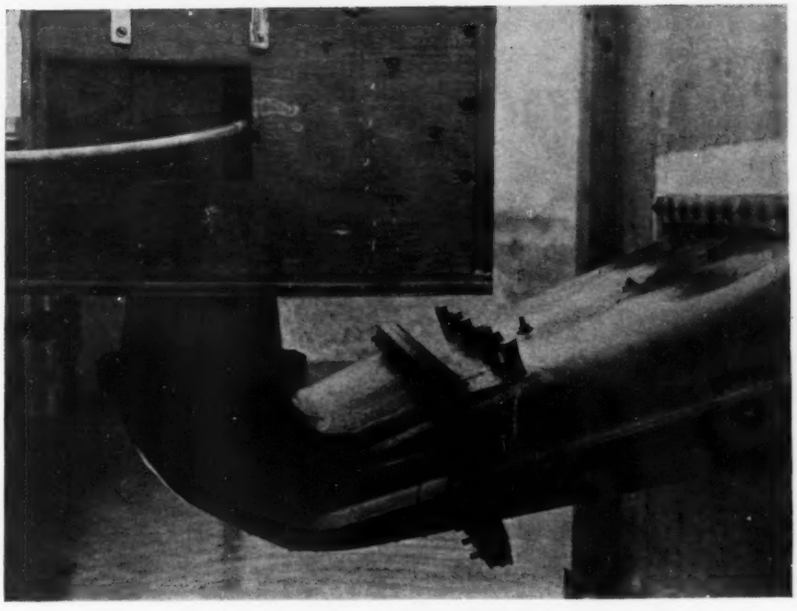


Fig. 5—Model draft tube molded from transparent plastic

Testing apparatus

The installation used for the draft tube tests consisted of a weir box from which the water passed into the upper head tank. From the bottom of this tank we secured the draft tube (see Fig. 1). The lower tank or tailrace was installed and connected to the exit of the draft tube. The discharge from the tailrace tank was controlled by a valve which varied the operating head on the tubes. In order to obtain the best visual inspection and slow-motion pictures it was necessary to use clear water. A sump was built into which the water passed from the tailrace tank. A vertical pump having a capacity of 1 sec.-ft. was installed in this sump, which returned the water to the weir tank, this flow also being regulated by a valve. Over the entrance to the draft tubes was installed an inverted cone so constructed out of brass that small ⅛-in. vanes could be installed in five different angles. By this method different angles of whirl could be given the water before entering the draft tube, therefore simulating the action of the runner.

Movable baffles were installed in the weir tank and upper head tank, so placed and regulated as to retard surges and uneven flow. The quantity of water was measured by a 90-deg. "V"-notched weir fitted in the weir box. Two connections were made from the bottom of the box to a stillwell, where the head was measured with a hook gage. A similar arrangement was used to measure the height of water in the head tank and the tailrace tank. Four ½-in. piezometer connections were mounted on the 6-in. diameter pyralin entrance piece connecting the upper head tank to the draft tube and placed at right angles to the flow, which provided a means of determining the average throat pressure. These four piezometers were connected into one rubber hose and then to a gage glass mounted on the same board with the head and tailwater gages, making it convenient to read all three simultaneously. The principal object of these experiments was to determine the amount of velocity head regained by the different draft tube models. This system was used only as a basis of comparison in the initial tests, the final tests being made on the complete turbine installation. The three draft tubes showing the highest regained velocity head were used with the turbine.

Water was allowed to circulate through the set-up until the head and tailwater became constant. At that time the quantity and the different head readings were taken. The head was then changed, still maintaining the same flow, and the readings taken again. After recording the effect of varying the head, the quantity was changed and observations repeated. Upon completion of this procedure a different set of vanes was installed giving the water a different angle of whirl and the above-mentioned tests repeated. Each of the tubes was tested in this manner using five different angles of whirl, namely, 0 deg., 7½ deg., 15 deg., 30 deg and 45 deg. Considerable study was made in an attempt actually to check the energy dissipated through the centrifugal action of the different angles of whirl. It can easily be seen that the piezometer throat pressure readings for straight flow could be accurately read, but as the whirling component increased the centrifugal force would give a higher reading than the true average throat pressure.

Straight flow efficiency was based on the amount of velocity head regained by determining the quantity of water flowing from the weir, and by using the area of the throat of the draft tube the velocity was computed, thus giving the velocity head $\frac{V^2}{2g}$.

The amount of velocity head regained was taken as the difference between the pressure reading at the throat and the height of the tail-water gage; thus the per cent of efficiency could be figured as this difference divided by the velocity head. In order to obtain a satisfactory means of comparing the tubes when subjected to various angles of flow it was necessary to adopt a new method; the efficiency of the tube subjected to the various whirls was

Efficiency equals $\frac{(C_2/C_1)^2 - 1}{(C_2)^2}$ in which C_1 equals $\frac{Q}{A\sqrt{2gh_1}}$ coefficient without draft tube.

C_2 equals $\frac{Q}{A\sqrt{2gh_2}}$ coefficient with the draft tube.

A = Area at throat of runner.
Q = Quantity as measured by weir.
$h_1 = (H_{A1} - H_{B1})$ — orifice loss in friction box).
$h_2 = (H_A - H_B)$ plus (velocity head at exit).
Ha_1 = Headwater without draft tube.
Hb_1 = Tailwater without draft tube.
H_A = Headwater with draft tube.
H_B = Tailwater with draft tube.

To obtain the data necessary for computing C_1 a large rectangular box was in-

[*Continued on page 77*]

Superposition Turbine Going Into Fisk Street

Into the historic Fisk Street station of the Commonwealth Edison Company, where the earliest large turbo-generator installation in this country was made at the turn of the century, now goes the latest development in the art of fuel power electricity production. Work has started on the addition of a high pressure, high-temperature turbine to be superposed on two existing machines, the whole making a very efficient compound unit of 90,000 kw.

By BERNHARD SCHROEDER

Vice-President and Chief Engineer Sargent & Lundy, Inc., Chicago, Ill.

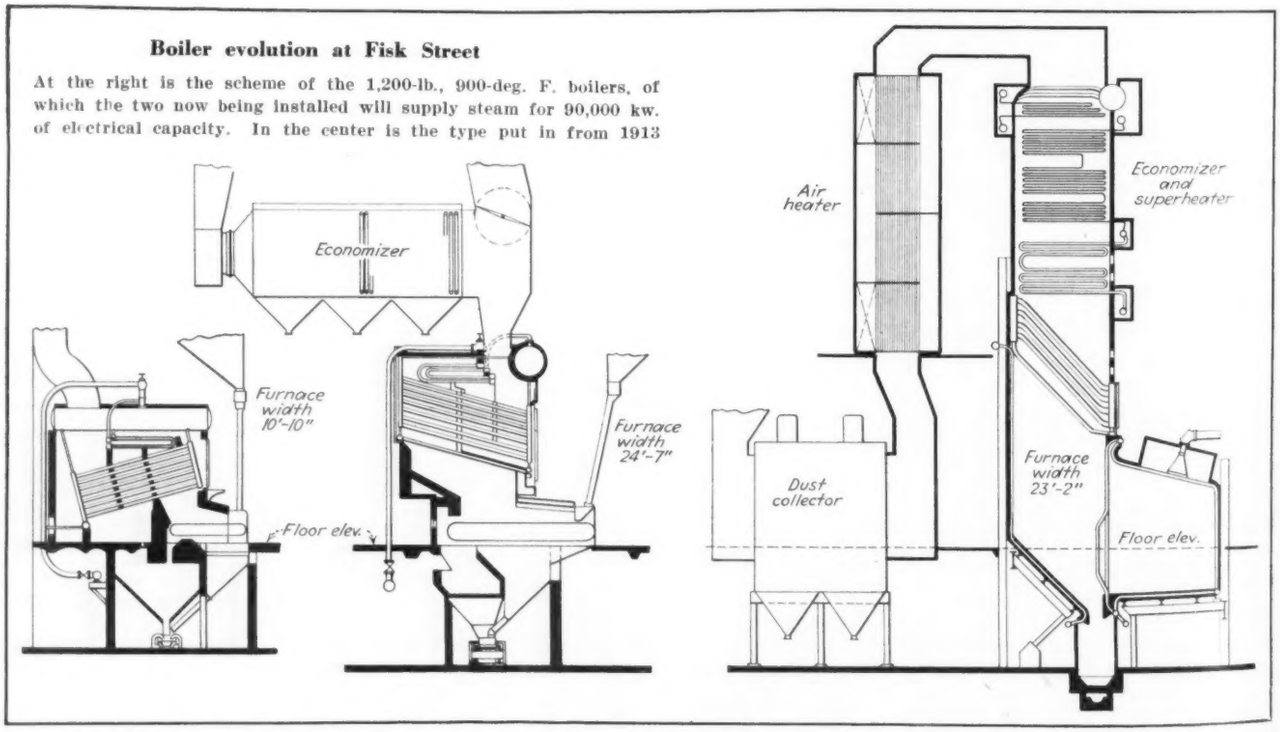
LATE additions of capacity to the Chicago power pool—State Line, Powerton, Waukegan—have been at places outside the city, due largely to restricted circulating water conditions, and as a result generation within the Chicago system itself has not kept pace with new developments when comparisons of fuel economy with newer installations outside of the city proper are made. This condition is about to be changed with the installation of a 30,000-kw. high-pressure turbo-generator at the Fisk Street station of the Commonwealth Edison Company. The exhaust of this turbine will be taken by two present machines, one of 25,000 and the other of 35,000 kw. capacity. The resulting compound unit of 90,000 kw. is expected to show an economy of 12,150 B.t.u. per kilowatt-hour.

The new turbine is rated at 30,000 kw. at 95 per cent power factor, with entering steam at 1,200 lb. pressure, 900 deg. F. temperature, and is direct connected to a 25-cycle generator. The machine will operate at 1,500 r.p.m., but it has been designed so that if at a later date it should become desirable to replace the 25-cycle with a 60-cycle generator the turbine can be speeded up to 1,800 r.p.m. It is of Allis-Chalmers make with single impulse wheel and 28 reaction stages.

Two boilers will supply all steam required for this 90,000-kw. combination. Steam will exhaust from the new turbine at 220 lb., 550 deg. F. into the steam leads to its associated machines, Nos. 11 and 12, also on the 25-cycle system. If from a loading standpoint it should be desirable, it will be feasible to exhaust part of

Boiler evolution at Fisk Street

At the right is the scheme of the 1,200-lb., 900-deg. F. boilers, of which the two now being installed will supply steam for 90,000 kw. of electrical capacity. In the center is the type put in from 1913



to 1918, the last major expansion period of the station. Four of these boilers produce steam for 30,000 kw. At the left is the kind of boiler installed from 1903 to 1905. Eight of these are needed for 5,000 kw. Sixteen of the type in the center are used today in the regular operation of the station and of the one at the left, the remaining of the 32 originally installed are used when necessary. Drawn to the same scale, these sketches furnish a graphic illustration of boiler development.

the steam to either of units 13 or 14 and produce 60-cycle current as well as 25-cycle current. Arrangement will be provided so that if for any reason the high-pressure unit trips out, high-pressure steam will be bypassed through a pressure-reducing valve and desuperheating equipment so as to feed 220 lb. steam to units 11 and 12 without much, if any, loss of load on these units.

Each of the two identical steam generators will have a continuous steaming capacity of 375,000 lb. per hour and a maximum of 412,500 lb. per hour. The heating surfaces of each unit are distributed as follows:

Furnace	5,070 sq.ft.
Steam generating section	6,640 sq.ft.
Superheater	19,800 sq.ft.
Economizer	12,000 sq.ft.
Air heater	56,200 sq.ft.
Total	99,710 sq.ft.

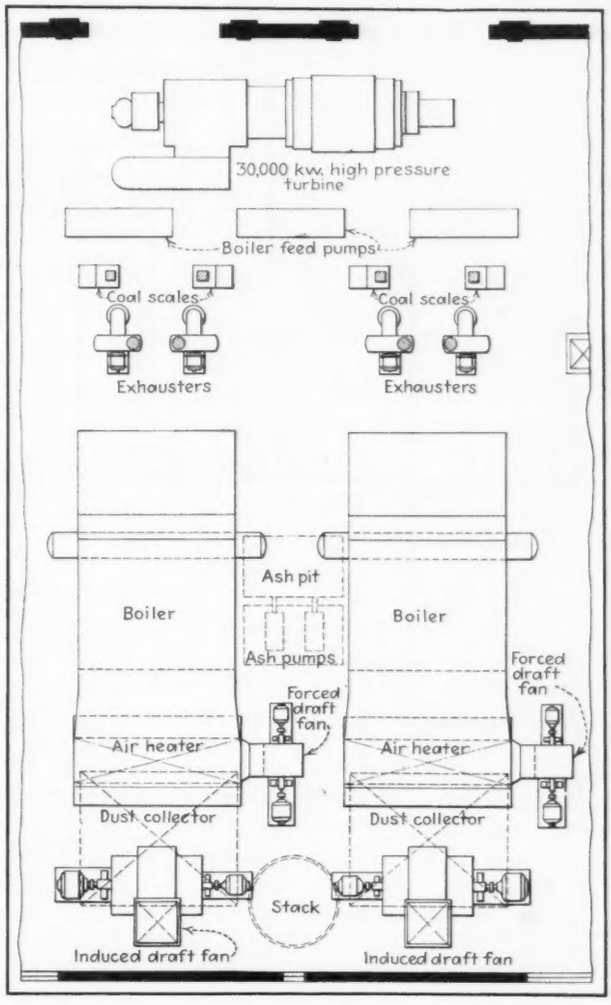
Percentages of heat absorbed by the different sections of the unit are, approximately:

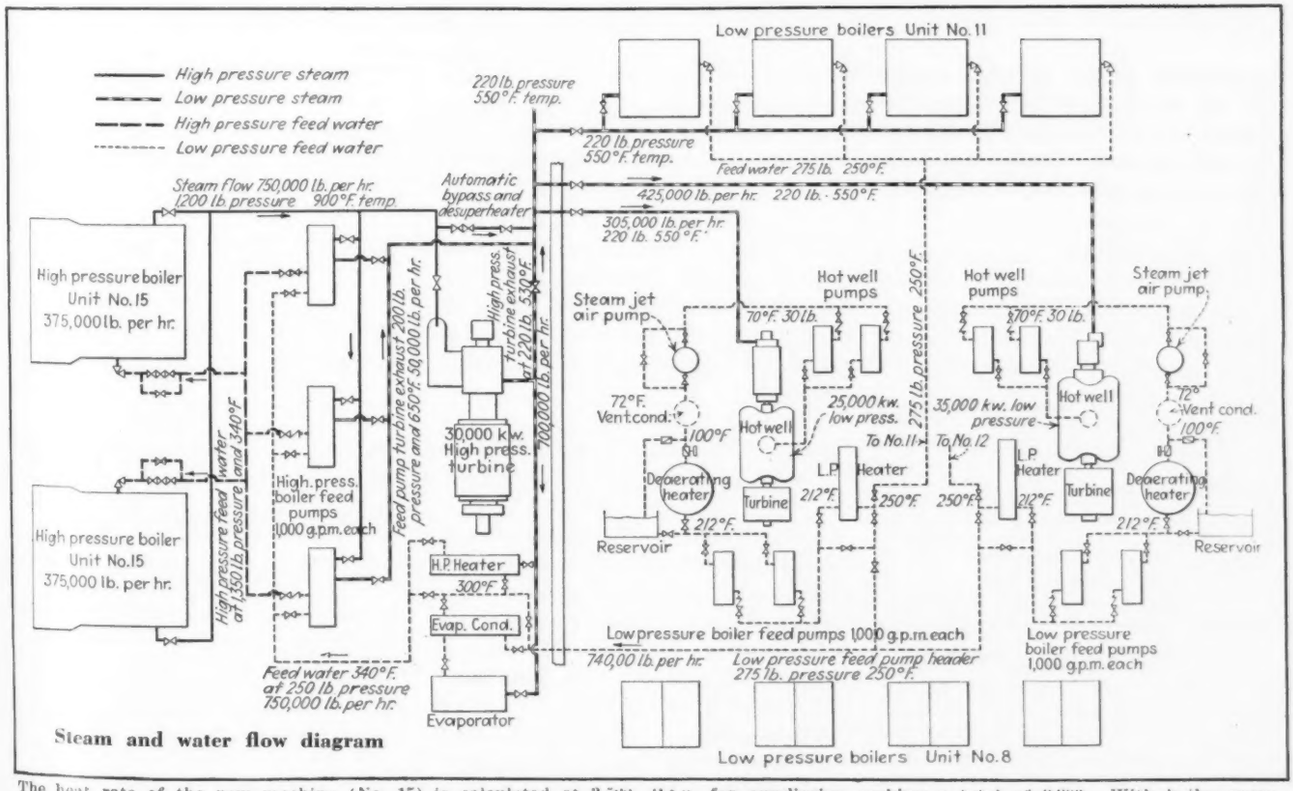
Furnace	42
Steam generating section	12
Superheater	25
Economizer	13 5
Air heater	7 5

Heat release in the furnace will be 31,600 B.t.u. per cu.ft. per hour and

New turbine will go into boiler room space

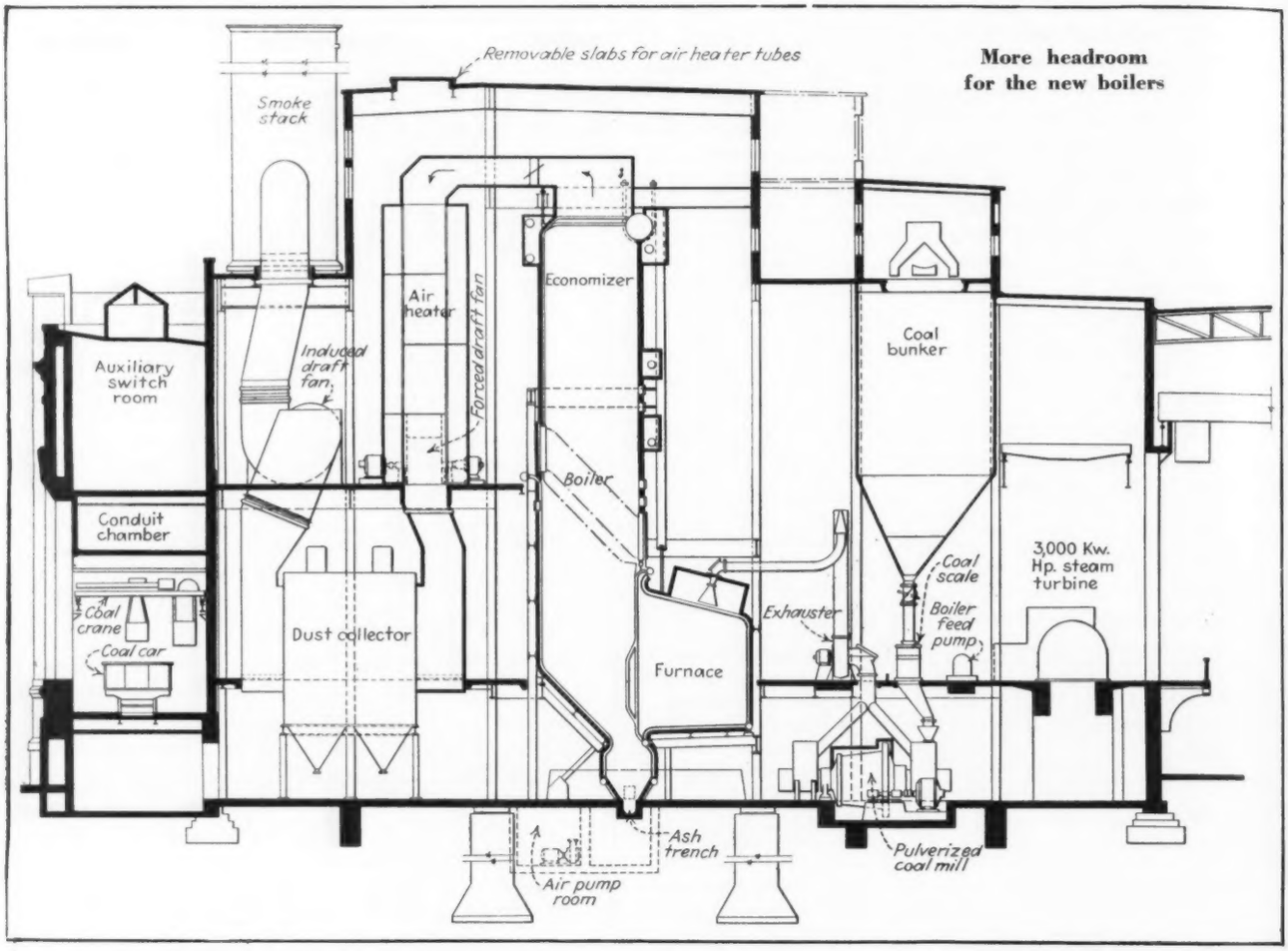
Here is a plan view of the new installation, comprised of two steam-generating units with pulverized fuel equipment, forced and induced draft fans, dust eliminators and one 30,000-kw. turbo-generator. This equipment all works into the space formerly occupied by the sixteen boilers of units 9 and 10, the only change in outline of the building being in the height. The turbine is located close to the present division wall between turbine and boiler rooms and it is the intention to provide large openings in this wall. There will be three turbine-driven feed pumps adjacent to the turbine. Fuel pulverizing equipment is located in the basement at the front of the steam-generating units, with the coal scales and exhausters, which blow the pulverized fuel into the furnaces, set just above the pulverizers. The forced-draft fans are located on the sides and induced-draft fans at the rear of the units, as are also the dust collectors.




High pressure steam
Low pressure steam
High pressure feed water
Low pressure feed water
Low pressure boilers Unit No. 11
220 lb. pressure 550°F. temp.
220 lb. pressure 550°F. temp.
Feed water 275 lb. 250°F.
Steam flow 750,000 lb. per hr. 1200 lb. pressure 900°F. temp.
Automatic bypass and desuperheater
425,000 lb. per hr. 220 lb. 550°F.
305,000 lb. per hr. 220 lb. 550°F.
High pressure boiler Unit No. 15 375,000 lb. per hr.
Steam jet air pump
70°F. 30 lb.
Hot well pumps
Hot well pumps
Steam jet air pump
72°F. Vent cond.
100°F
98
Deaerating heater
Hot well
Turbine
212°F.
25,000 kw. low press.
To No. 11
L.P. Heater
212°F.
250°F.
275 lb. pressure 250°F.
35,000 kw. low pressure
To No. 12
Hot well
L.P. Heater
Turbine
Deaerating heater
212°F.
Reservoir
Reservoir
High pressure feed water at 1350 lb. pressure and 340°F.
High. press. boiler feed pumps 1,000 g.p.m. each
Feed pump turbine exhaust 200 lb. pressure and 650°F. 50,000 lb. per hr.
High press. Turbine exhaust at 220 lb. 530°F. 700,000 lb. per hr.
30,000 kw. High press. turbine
H.P. Heater
300°F.
Evap. Cond.
High pressure boiler Unit No. 15 375,000 lb. per hr.
Feed water 340°F. at 250 lb. pressure 750,000 lb. per hr.
Evaporator
Low pressure boiler feed pumps 1,000 g.p.m. each
740,000 lb. per hr.
Low pressure feed pump header 275 lb. pressure 250°F.
Low pressure boiler feed pumps 1,000 g.p.m. each
Low pressure boilers Unit No. 8

Steam and water flow diagram

The heat rate of the new machine (No. 15) is calculated at 3,520 B.t.u. for auxiliaries, making a total of 9,900. With boiler room efficiency of 84 per cent and operating efficiency ratio of 97 per cent calculated over-all thermal efficiency becomes 12,150 B.t.u. per kw.-hr. B.t.u. per kilowatt-hour and of existing units Nos. 11 and 12 a 12,500 B.t.u. The combined rate is 9,500. To this is added 400



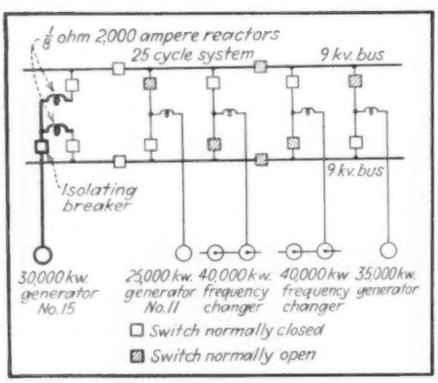
Coal comes in on a belt fed from an existing conveyor, then down through the bunker to the coal scales, feeder, pulverizer, exhauster and to the furnace. The gases rise through the steam-generating section, superheater and economizer in a single pass, then down through the air heater to the dust eliminator, to the induced-draft fan and to the stack. Each coal bunker has a capacity of 600 tons, which is sufficient for a 30-hour run. The stack is 13 ft. inside diameter by about 300 ft. high.

the efficiency of the complete boiler unit will be about 86 per cent. The furnaces have vertical slag screens and slag tap bottoms. Gases rise vertically in a single pass through the steam-generating tubes, superheater and economizer, then over to the air heater and to the dust collector, etc. Provision is made in the design so that by changing the ratio of gas through the superheater and economizer a fairly constant superheat temperature can be maintained and automatically controlled. The steam-generating unit will be incased in a steel jacket with joints welded to make it airtight.

The four vertical burners in each furnace will be fed from two 15-ton per-hour Hardinge ball type pulverizers.

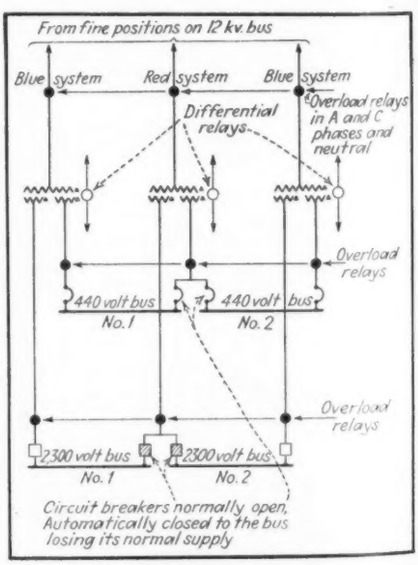
Each boiler unit will have one forced-draft fan driven by a constant-speed motor, but having vane control on the inlet in order to improve its efficiency. The fan will have a capacity of 128,000 cu.ft. per minute against a pressure of 9.7 in. of water maximum. There will be one induced-draft fan for each steam-generating unit driven by two motors, one

[*Continued on page 104*]



Bus connections are simple

Here is how it is intended to tie the new unit into the electrical system. No great amount of new construction is necessary nor any extensive revision of existing structures. The only significant difference from existing practice is the use of two reactors and isolating breaker.


From fine positions on 12 kv. bus
Blue system
Red system
Blue system
Differential relays
Overload relays in A and C phases and neutral
Overload relays
440 volt bus No. 1
440 volt bus No. 2
Overload relays
2300 volt bus No. 1
2300 volt bus No. 2
Circuit breakers normally open. Automatically closed to the bus losing its normal supply

Energy supply to auxiliaries

Three 4,000-kva., 60-cycle transformers will be installed for auxiliary supply, one of them a spare. Each transformer has two secondary windings, 3,500 kva. at 2,300 volts and 500 at 440. Because of difficulty in its application in this particular instance, the fault bus protection usual in Commonwealth Edison practice is here replaced by differential relays.

Power Sales Swell Output

July revenue increase is largest in years, with output 15 per cent over 1935 — Drought loads steam plants

NEW RECORDS for the month, well in excess of those in any previous year, were set by July operations of the electric light and power industry. Revenue from ultimate consumers, rising 10.9 per cent over the like period a year ago, amounted to $167,671,900, according to the Edison Electric Institute. This was nearly 8 per cent more than in 1931, when it was reported as $155,556,800, and it overshadowed the income in July of 1929, which has come to be regarded as a reference year, by 12.5 per cent.

Examination of the records for the past fifteen years discloses no instance of an increase from June to July. That precedent has been decisively broken, the increase was around $3,660,000. Finally, the rising trend in the rate of gain over 1935 should be noted. In January it was 5.3 per cent; in July close to 11 per cent.

More impressive than the revenue is the rising tide of energy production and sales. Output, 9,041,600,000 kw.-hr., was 15.2 per cent greater than a year ago and about 22 per cent more than in the month in 1929. It went well above the preceding winter maximum. The larger total output, combined with a heavy drop in the energy produced from water power, called for more production from fuels, so that this item was about 38 per cent larger than a year ago and set a new peak for any month.

The expansion was due most of all to the continued growth in wholesale commercial sales—that is, industrial power—which were 25.8 per cent ahead of last year's July and well above the peak of August, 1929. These sales constituted 58 per cent of the total to ultimate consumers. Second was the effect of an increase of 16.8 per cent in retail commercial sales, and third of 10.2 per cent in domestic.

Customer growth continues, according to the E.E.I. report, but not at the rapid rate of the 1920 decade. The twelve-month period ended July 31 brought a net increase of about 500,000 in the number of domestic users. Average annual consumption per residential customer during that period was 701 kw.-hr., against 652 in the preceding one, with the average rate dropping to 4.84 cents.

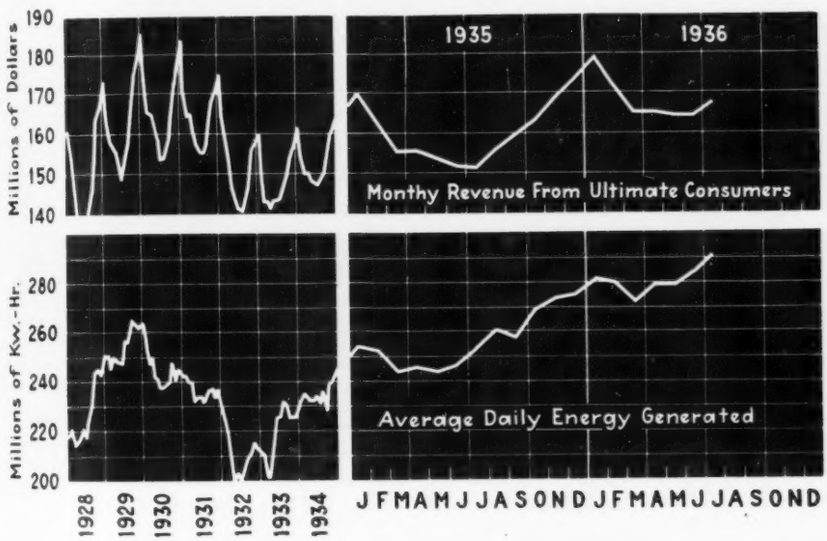


Table 1—Monthly Revenue from Ultimate Consumers and Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1936	Revenue from Ultimate Consumers†		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
July	167,672	+10.9	9,042	+15.2	2,822	—15.2	6,220	+37.8
June	164,007	+8.3	8,592	+14.0	2,996	—7.5	5,596	+34.1
May	164,015	+7.1	8,604	+14.0	3,702	+ 5.3	4,902	+21.2
April	165,703	+6.2	8,422	+14.2	3,802	+11.0	4,620	+17.0

Table II—Regional Revenue and Energy Output in July, 1936

Compared with Corresponding Month of Previous Year

Geographical Region	Revenue from Ult. Consumers		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
United States	167,672	+10.9	9,042	+15.2	2,822	—15.2	6,220	+37.8
New England	13,766	+ 9.6	574	+12.2	174	—19.7	400	+35.5
Middle Atlantic	45,775	+ 7.5	2,168	+12.4	417	—38.0	1,751	+39.5
East No. Central	38,957	+ 8.8	2,127	+17.5	99	—50.0	2,028	+25.8
West No. Central	14,398	+13.3	602	+ 9.3	88	—52.7	514	+41.0
South Atlantic	22,022	+20.6	1,092	+24.0	378	—26.3	714	+95.0
East So. Central			330	+11.8	203	—17.0	127	+152.0
West So. Central	9,623	+10.8	483	+13.0	11	—26.0	472	+14.4
Mountain	5,407	+16.3	375	+21.3	308	+20.2	67	+25.0
Pacific	17,724	+10.6	1,291	+15.8	1,144	+11.9	147	+56.6

* By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central station.
† Preliminary, Edison Electric Institute.

Table III—Allocation of Energy July, 1936

Compared with Corresponding Month of Previous Year
(Edison Electric Institute)

Class of Service	Millions of Kw.-Hr.	Per Cent Inc.
Total for distribution*	9,163	+17.5
Lost in transmission, etc.	1,644	+ 7.4
Sold to ultimate consumers	7,519	+20.0
Domestic	1,160	+10.2
Com'l, small light and power	1,317	+16.8
Com'l, large light and power	4,362	+25.8
Municipal street lighting	171	+ 0.5
Railways—street, interurban	342	+ 3.9
Railroads—electrified steam	99	+47.1
Municipal and miscellaneous	68	+34.6

* Generated, purchased from other sources, imported, less energy used in railway and other departments.

Editorials

L. W. W. MORROW . EDITOR

When the Politician Turns Engineer

VISITORS to the great federal public works which are now under construction, such as Tennessee Valley, Fort Peck, Bonneville and Grand Coulee, cannot fail to be impressed by the magnitude of the undertakings, the excellence of the housing, construction plant and construction methods, and almost invariably come away with the conviction that here is a great and necessary work that is being splendidly done.

The information that is given out at all of these projects deals with physical things—the size of the dam and power house, the installed capacity of the equipment, the cubic-yards of earth or concrete, the magnitude of the monument that is being built. There is not one word as to the economic features of the project in the descriptive literature that is given to visitors.

During the past few months Prof. H. E. Riggs visited five of these major construction jobs. He went over the work with the engineers in charge. He had every opportunity to see every phase of the work, inspect the construction ptant and observe the construction methods. Every question he asked was freely and fully answered so long as it dealt with engineering plans or construction methods. But when the question bore on markets, revenues or otherwise touched on economic questions, it became evident that the government engineers are supposed to confine themselves to engineering topics and not to discuss any other features of the work.

So Professor Riggs sought in other places for the answers to those questions that could not be answered on the job. He found the answers in the records of the Congress of the United States, in the reports of Army and Reclamation Bureau engineers, in the statements of officers in the government, in federal census and other statistics. Read in this issue his article "Economic Aspects of Grand Coulee" and see the weird land into which Professor Riggs' inquiry led him, a land where nonsense outweighs sense, where facts are denied their value and where the laws of economics are twisted into utter fantasy.

•

Sell Darkness for Sake of Dispelling It

INKY DARKNESS is a background asset to floodlighting that gives night an oft-neglected chance to outshine the day in the matter of selling appeal. Selling used cars is uniquely one of the businesses that is more active in the evening than during the day. It is astounding how much more attention-attracting a neat used-car lot is when adequately floodlighted. One of Duquesne Light Company's customers put in 25 foot-candles—no less—and the gain in business was in excess of 25 per cent, according to the proprietor. He is intent on having his patrons see what they are buying in its best light. Decision is quicker and satisfaction sustained.

But the big factor is to get the customer's attention. A look at the pictures taken by day and by night reveals instantly why they step into the mart. All the distraction of the spottily and dimly illuminated background is blotted out by the suffused superabundance of flooded light. The darkness of the background is as much an asset as darkness can be a liability in dealing with patrons who first have to be compelled to look and then be persuaded about goods quality. The light salesman can well drag contrasty darkness in as a talking point. "Everybody drives a used car" and more must buy those which the wave of new automobile sales is projecting into the trade.

•

Centralize Man-Power for Economy

THE problem of keeping utility costs in line with generally decreasing rates has only been partially solved in many cases. It is admittedly a difficult problem, particularly so since the rates of pay for man-power have been consistently moving upward and are higher today than at any previous time in utility history, and the cost of man-power is one of the most important items in cost of utility service.

That very difficulty, however, can be, and in many cases actually has been, turned to advantage. For by concentrating on the phase that has the heaviest effect on costs, increases in its efficient use have in many cases shown up to be possible that counterbalanced several times the expense involved in attaining these economies. Specifically, analyses along the lines indicated yielded the non-startling, but nevertheless very significant, answer that one of the principal sources for loss in or inefficient use of man-power occurs in the day-to-day operation of the distribution and service departments. In the broadest sense these cover activities such as store-

room, garage, transmission and distribution, dispatching, servicing and related activities.

The history of the development of many companies has been such that, of necessity, these various activities were initiated, developed and expanded at different times and at different rates. There have, therefore, been overflows into separate and, in many cases, widely segregated quarters. Perhaps the inconvenience that this entails has been recognized. But a study of the cost of centralizing and bringing under one roof all these activities comes up against the barrier of the discrepancy between the cost of such centralization and the rentals or other costs of operating over a widely scattered front.

The only trouble with such an analysis is that it fails to take into account the most important item—the inefficiency in the use of human labor—that segregated operation entails. For although the co-ordination and unification under one roof of most of the distribution functions may not always show a saving in rent, it is surprising how frequently that will be the case. What is, however, of equal, if not greater, importance is the fact that it helps promote better *esprit de corps,* and that always means better electric service.

•

Suckers for Sales Volume

IT IS only human for manufacturers and utilities to look at sales on a departmental basis. Department heads rely upon departmental showings rather than upon developments as a whole. Operating departments, for example, want large increments of kilowatt-hours at high load factors to show growth in output and reductions in unit costs. The merchandise department wants to show sales volume and presses for the sale of products that represent large gross and unit costs, such as ranges, refrigerators and water heaters. This is also true of the manufacturers. In addition, the compensation of the salesmen is based upon appliance sales dollar volume and they are forced to favor the sale of the heavy-duty appliances.

But the key to selling, from the point of view of utilities, is revenue additions at minimum cost. On this basis a small increase in the light bill of a minimum use customer may be more profitable than the increment use produced by the sale of a range or water heater.

Today's pressure on utility executives from their merchandise and operating departments and from the manufacturers is to sell heavy-duty appliances through direct and indirect sales efforts. No equivalent pressure is being brought to get a utility sales program developed on the basis of revenue and costs and returns based on profit from revenue increases as well as merchandising profit.

If this approach is made, undoubtedly lighting sales would be stimulated greatly. For lighting is the easiest and most profitable business to get from the point of view of revenue and profit. A test case is given in the story from the Philadelphia Electric Company in this issue. More of these case studies should be presented to utility executives.

It is high time that an analysis of utility selling be made for executives that will measure revenue and profit as well as merchandising and output volumes. This will permit development of a better-balanced and more profitable sales and sales promotion program.

•

When Streams Run Low

PROPONENTS of water-power developments are apt to overlook the need of an adequate amount of capacity in steam plants to assure continuity of service during periods of reduced stream flow.

This need is forcefully illustrated by power production statistics for the recent drought period. As reported by the Federal Power Commission, the output of hydro-electric public utility plants in July dropped 13 per cent under the amount generated a year ago. Coincidentally, due to a rising demand, there was an increase of 15 per cent in the total production. The effect was to throw an added burden on the fuel-burning plants equivalent to 35 per cent of last year's output for the same month.

That happened to be a rather low month for steam, and the comparison may seem to over-emphasize the increase. Let it be pointed out, then, that this new figure is 28 per cent higher than that for July 1929, and that it surpasses by 8 per cent the previous record for any month set in October, 1929, and duplicated in October, 1935.

What would have happened to the rising tide of manufacturing if our power companies had not been equipped with an adequate margin in steam to meet this contingency? What if they did not stand ready to face the even greater demand that may be brought about by a combination of winter loads and frozen water courses?

What will happen if the national consumption is geared up to the increased capacity of the new plants sponsored by the government unless these are backed by a sufficient reserve based on the use of fuels? What will happen to the cost of energy generated in those plants if standby plants are included in the computation, as they should be?

This is not an alarmist attitude, nor is it an argument against the proper utilization of our natural resources. It is merely a suggestion that sound engineering and sound economics require consideration of all the factors, not merely a selected portion of them, that are involved in an intelligent national power program. If we, as a people, blunder, then we, the people, must pay for the extravagance. No amount of sophistry can get around that cold fact.

Co-operatives Held in Dugout

CLEMENCEAU once remarked to Woodrow Wilson that the average Frenchman would cheerfully die for his country, but would not pay taxes to support it. This perhaps is the most succinct statement of the point that was ever made, but Americans have been smiling over a hundred stories illustrating this attitude of the French peasants for many years.

A considerable fraction of all humor, cynics tell us very convincingly, lies in sudden driving home of a point which makes those who laugh feel superior to those who happen to be the butts of the joke. So the Americans, chuckling at this peculiarity of the French, who are willing to die for their country, but not to pay taxes, were very distinctly looking down on the French.

It has always struck Americans that this French viewpoint was carrying the old proverb of "Pennywise, pound foolish" rather to extremes. It seemed as though the French valued their francs and even their sous more than they did their lives. It being easy to look down on and feel superior to any one putting what seemed to us such an exaggerated value on the sous and such a slight value on life, Americans have never bothered to delve very deeply into the mental processes which led the French to have such an attitude.

But it just so happens that there is very sound logic indeed in that French attitude, absurd as it may seem to the vacationing Americans. Let's divide it in two for simplicity's sake.

FIRST, their willingness to die for their country. There is nothing to laugh at about that whatever. In the first place we have always been taught to look up to that sort of patriotism. Nathan Hale was one of the early heroes of most of us. He regretted that he had only one life to give for his country.

Nor is this willingness to die for one's country confined to France and America. It is pretty nearly worldwide. A great many Ethiopians proved it last year. It is particularly universal, if that is a pardonable phrase, when it comes to laying down one's life in defense of one's country. The more the idea of defending one's home and fireside can be accentuated in considering this the more stirring the impulse. It is frequently asserted that the people living on the Atlantic and Pacific Coasts are stronger for national defense than the Middle Western folk.

Now it must be remembered that, regardless of the controversial points of history, regardless of whether Napoleon was trying to conquer Europe or merely to defend France, practically all Frenchmen believe their country is in constant danger of invasion. So, perhaps there is nothing strange about the willingness of the Frenchman to die for his country.

Which leaves the peculiarity—the point that makes the Frenchman the butt of this old joke so pointedly stated by Clemenceau—that the Frenchman is not willing to pay taxes to support his country.

Of course the Frenchman *does* pay taxes. He pays them knowingly, and does it with much grumbling. He cannot help it. Boiled down to its essence, what Clemenceau really meant is that the Frenchman perhaps is the most successful protestant in all the world against any *increase* in taxes. French government after French government has fallen—failed to get popular approval through the elected representatives of the people—because those representatives simply did not *dare* to vote any more taxes.

Just recently the debt piled up and up until devaluation of the franc became a necessity. There were other reasons, having to do with costs of manufacturing in international trade, etc., but the unbalanced budget would have forced it sooner or later anyway.

BUT perhaps, in his heart, the Frenchman has understood all along a fundamental fact that Americans may not learn for some years. To fight for one's country, and risk death in so doing, is one thing. It cannot be helped if an enemy attacks. But to pay taxes for politicians to squander on foolish and unnecessary things—that is something else again. That is to labor for strangers. That is to sweat without one's own children getting any benefit. That is to breed up a tribe of taxeaters who literally take the bread out of one's mouth.

Moreover, there was and is a way of getting at this omnipresent enemy. The Frenchman has long realized his power in this regard. He soon learned that his elected representative could be easily frightened if it were just made clear that his constituents would vote against him next time he came up for re-election if he voted to boost taxes.

So what it all boils down to is that the Frenchman is willing to die to defend his fireside, his home and his country. But he will do anything in his political power to keep the tax bloodsuckers off his property. If there is any truth in history, it was the taxes which kept the people hungry and produced the French revolution. And we seem to recall something about a tax on tea which precipitated the American revolution.

So, after all, what is so humorous about that oftenquoted remark of M. Clemenceau?

Moreover, there has been a political doctrine for many years even in this country about the unpopularity of taxes. There is an old story in Washington of the man who stayed in Congress term after term, weathering political shifts which carried many abler and more spectacular colleagues to defeat.

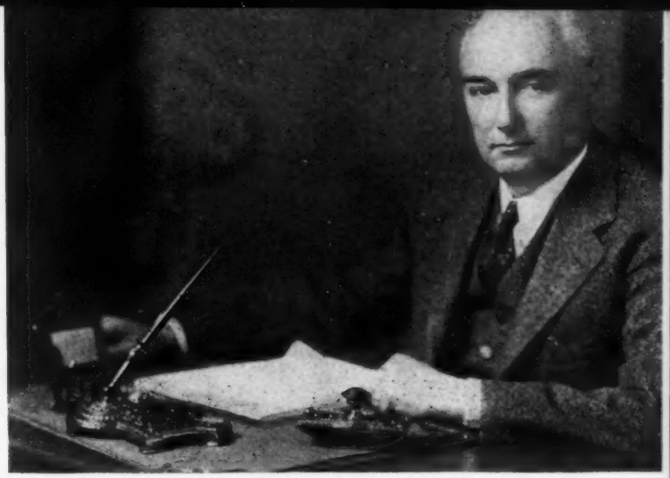
Asked the why and wherefore, he said:

"It is very simple. I vote for every appropriation that anybody wants. I vote against every tax no matter who proposes it."

In simple, homely language, that is the answer to a lot that is going on in this presidential campaign. Every student of taxation knows that this country is being eaten up with taxes at this very moment. Many countries which seem to be much worse are actually not so bad.

For instance, we hear much about the British taxes. The truth is that while the British taxes per capita are a

—By CARTER FIELD



This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him.

little less—very little—than ours, the United States is spending of the taxpayers' money more money per capita every year than the British government is!

We are simply piling it up in debt, which of course must be met in one of two ways. Either we must boost taxes sharply or we must go to inflation.

That seems to have crystallized into the real issue of the campaign—for, after all, even the charge that the Roosevelt Administration is leading the way toward communism is, in a way, wrapped up in the larger issue of spending and taxes.

THE important part of this taxation question—or inflation if it should go to that—is whether the Roosevelt Administration can stop excessive spending if it wants to, and whether it really wants to. The answers to those two questions depend on whether the person making them is for or against the New Deal.

Most New Dealers, when pinned down to a direct answer, will insist that the President has both the desire and the ability to stop the spending—to balance the budget, in short. Almost without exception critics of the New Deal deny that Mr. Roosevelt *can* stop, and many, though not all of them, deny that he even wants to stop.

Governmental expenses always keep on increasing. It is necessary to keep various groups, divisions and people in line. Pork barrel distribution is of the essence.

Gov. Alf M. Landon, after many attacks on the Roosevelt spending, promised the farmers six different kinds of relief, including money payments. Which led many of his supporters to criticise him rather harshly. Of course Landon does not believe his agricultural policy would cost anything like as much as Roosevelt's. He believes eliminating all but the family size farms would reduce the payments enormously. He believes growing all the agricultural products in this country which are now imported would make work for more than half a million farm families, which would then need no government aid. Etc.

But the point is he *had* to promise something. And did. And will keep the promise if elected.

But there is a very sinister phase to this question of taxation to which far too little attention has been given. More and more the government has been moving into the field of private initiative. It just happens that the electric industry so far is the worst sufferer. But there is no telling where it will stop.

For the duration of the campaign, for example, the proposal of consumer co-operatives, to study which the President sent a commission to Europe this summer, has been sidetracked. In fact, a Maxim silencer has been clapped down on it. Just as a Maxim silencer has been clapped down on Prof. Rexford G. Tugwell. But neither is under a permanent banishment from the President's plans. Assuming Roosevelt's re-election, Tugwell will emerge from his present hiding in Arizona playgrounds, just as he returned from Europe after the 1934 campaign was over. Secretary of Agriculture Henry Wallace will resume his enthusiasm for consumer co-operatives.

When the government goes into the electric business in a small community, as for example when the city government of Omaha went into the electric business some time ago, the tax angle does not seem very important. It is thought of only as a little cockeyed bookkeeping when no taxes are paid to Omaha by the plant. There is almost no thought given to the point that if a privately owned corporation were operating the plant it would not only be paying local taxes to Omaha, and state taxes to Nebraska, but a pretty sizable amount of corporation income taxes to the federal government. If the company were well operated and profitable it would have the effect also of increasing substantially the amount of federal income taxes paid Washington by its stockholders and bondholders.

BUT now the government is really going into the electric business in a big way. If it continues its present policy there is no telling where it will stop, short of operating the entire electric industry of the whole country. Meanwhile, the government is doing everything in its power to encourage municipalities to build their own electric plants and install municipally owned distribution systems.

Let's assume the consumer co-operative movement gets going as Henry Wallace would like to see it, competing with merchants, competing with mail order houses and chain store systems, which will be harassed more and more by legislation such as the Patman-Robinson law. Incidentally, the threat is already made of a new law forbidding any manufacturer to sell his product direct, thus hitting at the most effective loophole now open to the chains and mail order houses.

Where is the government to stop? And who is to pay the taxes necessary to support the government? Especially as the government shows a strong inclination to subsidize heavily every line of business it enters, thus seeming to prove, by its own bookkeeping, that each move into private business was a wise one, benefiting all the people?

The situation is far more serious than nine hundred and ninety-nine persons in a thousand realize.

News OF THE WEEK

Utilities' Rate Reduction Record Stressed by President Kellogg

Empire State convention hears E.E.I. president emphasize constantly lowered rates, learns rural construction in New York proceeding five times faster than a year ago

Addressing the thirty-first annual convention of the Empire State Gas and Electric Association, C. W. Kellogg, president of the Edison Electric Institute, declared that the most effective answer to charges of excessive electric rates was the steady reduction in household rates going on month after month, accompanied by growing use of current.

What the public wants from electric utilities, the speaker said, is "the best possible service at the lowest possible cost." Perfect service meant not only mechanical perfection, but fair treatment of customers and employees, and enlightened public policy. There should be rate structures which would enable each customer to make the most economical use of electrical energy for his particular requirements, and vigorous sales organizations to acquaint the customers with such charges.

"It has seemed to me," said Mr. Kellogg, "more and more in recent years that the most effective answer that could possibly be made to the charges of excessive rates, which have been made by government protagonists, is the steady reduction in household rates which goes on month after month, accompanied in most cases by growing consumption of electricity in the home. This is the most effective propaganda in the world because it represents the deliberate choice of millions of thrifty householders to use more electricity rather than to spend that money on something else. It depends on individual economic self-interest, not on books, pamphlets, magazine articles or speeches. It is the solidest foundation on which any business can rest. While the politicians have been howling, the industry has been 'saying it with service and rates.'"

Ernest R. Acker, president of Central Hudson Gas & Electric Corporation, as president of the Empire State Association, reviewed the year's progress.

Rural construction quintupled

In the first six months of this year nearly five times as much rural line was completed as in the same period last year, Alfred H. Schoellkopf, president of Niagara Hudson Power Corporation, told convention delegates. Of 160,000 real working farms in New York State, 66,000, or more than 40 per cent, are now connected to rural lines supplying central station service.

Col. Charles G. Blakeslee, ex-counsel New York State Public Service Commission, said the commission was now progressive and realistic "because the commission regarded itself as directly and positively representing the ratepayers."

Utility men were urged to become better informed on the old-age and unemployment problem by B. Folsom, treasurer Eastman Kodak Company, because he felt the Social Security Act or similar legislation was inevitable.

Power Exchange Plan Expected to Develop

From the Washington Bureau of ELECTRICAL WORLD

Although no announcement has been made, it is understood that preliminary negotiations leading to the extension of the interchange agreement between the T.V.A. and the Commonwealth & Southern system have been progressing satisfactorily. There is little doubt that a satisfactory arrangement can be completed for the interchange of power, as before, pending further discussion of a permanent peace between the federal government and the utility industry. No further meetings are scheduled in the near future, but it is quite possible that they may not be necessary, as substantial agreement upon the terms of the temporary extension are believed to have been reached following three White House conferences.

Official announcement of the extension may come from the White House, but will more probably originate at the Knoxville offices of T.V.A.

•

Boulder Dam Given More Life This Week

Current generated by the world's largest generator at the world's largest power plant began its journey over the world's longest transmission line Wednesday, with the starting of the first 115,000-volt generator at Boulder Dam. The current is transmitted 266 miles across the Southwest desert and mountains to the Los Angeles Municipal Light and Power Bureau, the first paying customer of the dam.

The generator is one of a proposed

set of fifteen, which, together with two 55,000-hp. generators, is designed to give the project an ultimate capacity of 1,835,000-hp. It weighs 1,000 tons; the rotor weighs 600 tons. The first generator at the project was started by President Roosevelt some four weeks ago; it was a 3,500-hp. unit, used to supply power for the station at the dam and for Boulder City.

In addition to the power contracted for by Los Angeles, the metropolitan district, smaller municipalities and private corporations, Arizona and Nevada are scheduled to receive 18 per cent of the total final power developed.

•

Danville Power Plan Authorized by Commission

The Virginia Corporation Commission has authorized the city of Danville to go ahead with its $2,750,000 municipal power development on the Dan River at the Pinnacles. R. A. Moncrief, project engineer for the city, stated after the hearing that the project would begin at once and would be completed by December 15, 1937. About 20 miles of road already has been built up to the site of the dam in Patrick County, according to Mr. Moncrief. This is a P.W.A. project.

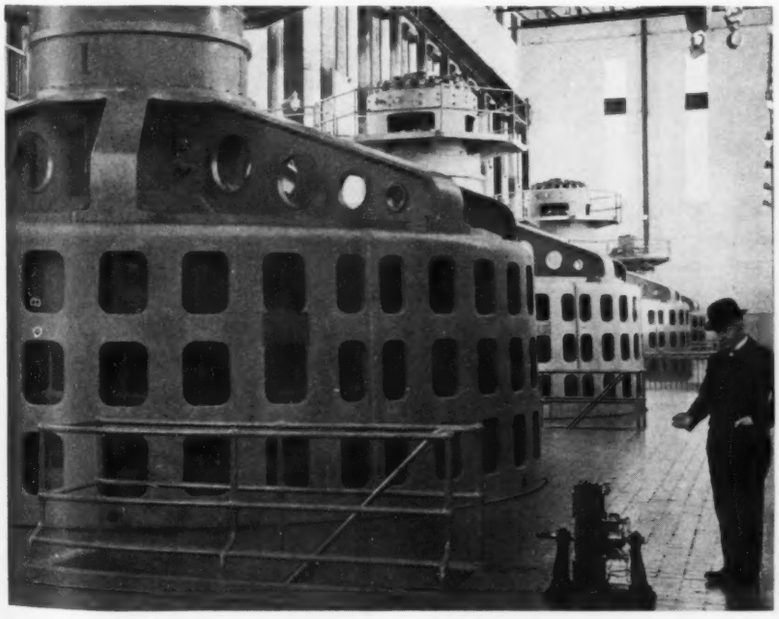
Air-Conditioning Sales Said to Be Doubling Every Year

"Air-conditioning equipment sales may be expected to double every three years, and by 1945 the volume should reach more than a third of a billion dollars annually if present market acceleration continues," declared W. H. Carrier, board chairman of the Carrier Corporation, this week at the 23d annual conference of the Babson Statistical Organization at Wellesley, Mass. "In 1932 the industry did $8,500,000 worth of business, one million under 1929 but $2,000,000 above 1931. Competition was terrific at the low point of the depression and profits were nil. A foundation was laid, however, for a wider market, and it resulted in a rate of growth far beyond the conservative prophecies of 1932," said Mr. Carrier.

Estimated sales for 1934 were $16,000,000 back in 1932, or $10,000,000 short of the actual volume enjoyed. For 1936 a projection of the 1932 rate would have reached $40,000,000. In the first six months of 1936 the dollar volume of sales was about 10 per cent ahead of 1935, but the number of installations increased 30 per cent, clearly indicating a trend toward wider distribution and a smaller average size of units. "It seems safe now to predict," said Mr. Carrier, "that the volume in any subsequent year will be at least double that of 1932. The peak of sales is a long way off."

Interest in domestic air conditioning is keen, but if the market is to be developed along sound lines well-built and adequate equipment must be provided and sold without exaggeration of its capabilities, in Mr. Carrier's opinion. Even a minority of the industry can retard development if it resorts to flimsy equipment and misrepresentation of its serviceability. Mr. Carrier stressed the importance of better insulation in house construction as a factor in satisfactory service, including window construction permitting a desirable humidity without condensation. At the end of this year it is estimated that the connected load supplied by air conditioning in the United States will approximate 600,000 hp., and that by the end of 1945 the power load of this business will reach 4,000,000 hp., with an annual power cost of say $80,000,000.

Year-round conditioning equipment for the larger installations now costs about $250 per horsepower of connected load, said the speaker, who estimated the user of this service will pay to the power company annually from $20 to $25 per horsepower of connected load, and in the long run, considering the life or amortization period of the equipment, the power company will receive a greater return from air conditioning than the vendor of the apparatus. It is possible, Mr. Carrier believes, that by mass production methods and efficient selling the installed cost of an individual unit to cool a moderate-sized room may ultimately be brought down to between $250 and $300.



FIFTY YEARS OF GENERATORS — John Murphy, of Ottawa, Electrical Engineer, Department of Railways & Canals, and Board of Railway Commissioner for Canada, operated this 1.6 hp. dynamo fifty years ago. On the same site today is the row of 34,000 hp. vertical-type water-wheel generators of Gatineau Power Company's Chelsea plant

•

Fair Return Allowed Municipal Utility

The village of Boonville, N. Y., made the news columns again this week when the New York Court of Appeals held that the municipally owned utility in Boonville was en-

titled to earn a fair return on the value of the electric property owned by the village and used and useful in the public service.

The Public Service Commission had maintained that Boonville rates should be sufficient only to pay operating expenses on the property (plus $3,400 per year for contingencies) disregarding entirely the question as to whether rates were reasonable. The commission held that because the rates were sufficient to provide a return over and above operating expenses that the rates, *ipso facto*, were excessive.

Under this decision municipal plants, like public utility companies generally, are allowed to earn a fair return on the value of the property and customers must pay rates sufficient to achieve this purpose.

If the property is written off the books—as was the case in Boonville—the village may apply the earned fair return to other purposes such as tax reduction, for example.

The decision is contrary to the position taken by Gov. Herbert Lehman in vetoing legislation permitting municipalities to apply profits from publicly-owned utilities to tax reduction.

Tennessee Valley Experiment Said Supported by Ten Distant States

Utility committee computes 72 per cent of $491,000,000 power project is paid by citizens deriving no benefits

Hard on the heels of recent pronouncements that the U. S. taxpayers contributed 1½ cents toward the cost of every T.V.A. kilowatt-hour sold last year comes a survey by the Committee of Public Utility Executives which shows ten states outside the T.V.A. area are paying 71.83 per cent of the cost of the experiment in cheap power.

The following is a list of the ten ranking states, and their proportionate contributions to the T.V.A. on the basis of tax collections:

State	Percentage of Total Internal Revenue Collections	Proportionate Amounts Payable to T. V. A.
New York	20.38	$100,065,800
Illinois	9.79	48,068,900
North Carolina	8.60	42,226,000
Pennsylvania	7.40	36,334,000
California	5.36	26,317,600
Ohio	4.97	24,402,700
Virginia	4.28	21,014,800
Michigan	4.12	20,229,200
New Jersey	3.47	17,037,700
Massachusetts	3.46	16,988,600

Calculations of the committee are based upon the states, total internal revenue collections and proportionate amounts payable to T.V.A.

On the same basis, the state of Tennessee would pay only 65/100 of 1 per cent, or $3,191,500.

The project cost figure of $491,000,000 used by the committee represents only the capital cost of the completed or projected dams, flood control, reforestation and navigation projects.

Fixed charges, for amortization, interest and depreciation, are not included in the 1935 annual report, but net deficit for 1935 has been computed to be $1,465,698 by William M. Carpenter of Edison Electric Institute.

•

Appliance Financing Probably Continued

Financing of appliances and farm house wiring by the government may be expected to continue beyond February 1 regardless of whether the Electric Home and Farm Authority is extended by Congress, ELECTRICAL WORLD was told this week in Washington.

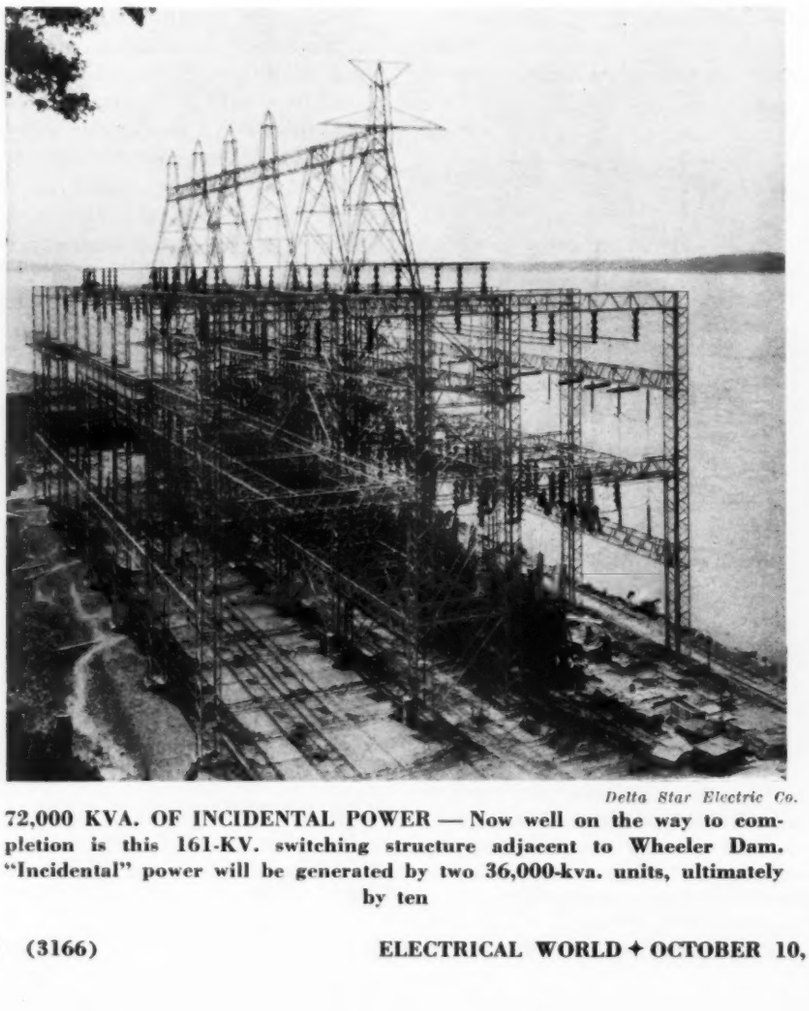
It was pointed out that should Congress decide to allow E.H.F.A. to lapse on February 1, the legislative power to continue long-term wiring and appliance financing rests in the Rural Electrification Administration. Details of the methods followed in a $30,000 loan to Pioneer Rural Electric Cooperative, Inc., Columbus, Ohio, are described in ELECTRICAL WORLD, June 27, 1936, page 5.

No difficulties are now foreseen in any changes which may take place in agencies, as probably the personnel of E.H.F.A. would be transferred with its records and familiarity and experience with present financing agreements.

•

Mississippi Rate Bill Vetoed by Governor

Gov. Hugh White of Mississippi vetoed a bill approved at the regular session of the state Legislature which would have permitted municipal



Delta Star Electric Co.

72,000 KVA. OF INCIDENTAL POWER — Now well on the way to completion is this 161-KV. switching structure adjacent to Wheeler Dam. "Incidental" power will be generated by two 36,000-kva. units, ultimately by ten

authorities to fix rates on electricity, gas and water in their communities. The Governor said he was vetoing the bill because "it would result in endless confusion." "Rates fixed by city authorities invariably are thrown into the courts," he stated, "and expensive litigation would result with most cities having no funds to pay such bills."

•

Chicago Company Accepts Reductions

After hearings, conferences and negotiations extending back to April 13, 1933, involving 20,742 pages of testimony, 264 exhibits and 74 witnesses the Illinois Commerce Commission has issued an order in the Commonwealth Edison Company case as follows:

Company's rate base is valued at $318,000,000 as of December 31, 1935.
Original cost as of December 31, 1934 did not exceed $296,000,000.
Residential rates are to be reduced $2,500,000 per year.
Commercial rates are to be reduced $500,000 per year.
Company will continue to absorb 3 per cent state public utility tax of $1,500,000 per year.

"I am naturally disappointed at the commission ruling," said Board Chairman James Simpson of Commonwealth Edison, commenting upon what is an 11 to 12 per cent reduction in revenues, "which in effect reduces rates by $3,000,000 for the ensuing year and requires the company to bear the Illinois utility tax of 3 per cent, amounting to $1,500,000 a year, without passing it along to our customers as other lines of business are allowed to do."

Under protest, and waiving none of its legal rights, the company rests on the rate base figure of $318,000,000 and on the commission's exclusion of $40,000,000 it wished to capitalize. Further, it concedes no original costs to be "sole or dominant factors in determining the rate base," nor does it commit itself to the commission contention that "since no accrued depreciation has been deducted from original cost, annual depreciation is herein considered as being computed on a sinking fund basis."

Commonwealth Edison has consented to the recent commerce commission order in reducing its rate base and rates, but it does so, said Mr. Simpson, "for the purpose of avoiding further litigation."

T.V.A. Hearing Set by Federal Court

Contending that the act creating the T.V.A. agency is constitutional, attorneys for the T.V.A. have filed a brief with United States District Court at Knoxville, Tenn., maintaining that the authority must be sued in its legal domicile, the northern district of Alabama. The brief was filed in a suit brought against the T.V.A. by nineteen private electric utility companies.

After hearing arguments on the T.V.A.'s motion to dismiss the suit on jurisdictional grounds some three weeks ago, Judge Gore asked both sides to submit briefs on whether the T.V.A. is constitutional, ruling that the issue of constitutionality would have to be decided as a means of deciding the jurisdictional question.

Briefs filed by the utility companies challenged this "validity" ruling (ELECTRICAL WORLD, September 26, page 60). The T.V.A. brief agreed with Judge Gore that the constitutionality of the T.V.A. would have to be decided but contended that the Ashwander and Boulder Dam cases, decided by the U. S. Supreme Court had settled that question.

"The courts in the Ashwander case, in holding that the disposal of power created at a valid government dam, was a proper government function, reaffirmed the long established principle that there are no elements of persuasion in such characterizations as 'competition,' 'utility operations' and 'proprietary business,' " the brief said in part. "The only issue on this motion is whether these defendants could be sued originally in the Chancery Court of Knox County, Tenn. . . ."

Judge Gore fixed October 10 as the date for the hearing of the T.V.A. motion to dismiss the suit.

•

Portland Utility Resumes Dividend

Resumption of the payment of preferred dividends by Northwestern Electric Company, Portland, Ore., was announced by the board of directors at its meeting September 18 by the declaration of a dividend of $5.25 per share on the first preferred 7 per cent stock. Payable October 1, this was equivalent to three quarterly payments. Prior to this payment there were undeclared accumulated dividends on this stock amounting to $26.53 per share.

The way had been opened for this declaration of dividends by agreement with the plaintiffs in litigation pending against the company for the past two years. This suit, brought by six or seven preferred-stock holders of Vancouver, Wash., questioned the adequacy of the consideration paid for the common stock, and when American Power & Light Company, present

COULD IT BE A KNOCK-KNOCK? — At any rate, Board Chairman A. W. Robertson (right), of Westinghouse and speaker at the Boston Conference on Distribution, is much amused by comments of Dr. Karl T. Compton, president of Massachusetts Institute of Technology

owner of this stock, agreed to reduce the par value of it from $100 to $35 per share, the plaintiffs dismissed the suit. Ratification of this agreement was effected at a meeting of the stockholders September 16. No dividends were declared on the so-called original preferred 6 per cent stock of the company, on which there is an accumulation of dividends of $23.50 per share. Dividends cannot be paid on this class of preferred stock until all the undeclared cumulative dividends on the first preferred have been paid.

•

F. P. C. Moves to Enforce Title II

The proposed formation of regional power interchange pools and the plan for "close co-operation" between federal and state utility commissions is regarded by some observers as an indication that the Federal Power Commission is losing no time in enforcing the provisions of the Federal Power Act incorporated in Title II of the Public Utility Act of 1935.

Five regional offices are planned by the commission; four have already been established—in Denver, New York, Atlanta and San Francisco—and one is scheduled to be opened on or before December 1, 1936, in Chicago. They are designed to make for closer co-operation with the states, with state regulatory bodies and with regional engineering offices of such federal projects as the TVA.

Plan outlines rate procedure

Private utility executives together with investment bankers have been meeting with government officials in an attempt to work out a practicable power transmission pool, but their efforts may have been hindered to a certain extent by the fact that the commission has the authority to order a private utilty to interconnect its transmission lines with those of other private or publicly owned systems.

The Federal Power Act states that the commission may "prescribe the terms and conditions of the arrangement to be made between the persons affected by such order, including the apportionment of cost between them and the compensation or reimbursement reasonably due to any of them." It is to be expected that private utility representatives will oppose any attempt on the part of the government to convert their transmission lines into common carriers for current generated at federal plants, especially when the current is to be transmitted to municipal distribution systems financed by federal loans and grants.

The plan for co-operation with state regulatory commissions outlines procedure for dealing with rate structures, costs, accounts, practices charges, similar matters of mutual interest through joint conferences, hearings, and even special boards. The F.P.C. is given a leading role in this co-operation scheme, however, for, according to one provision, the commission "shall have discretion to reject the nominee from any state, but shall thereupon invite a new nomination from that state" for appointment to the joint board. Furthermore, it may, "when in its discretion sufficient reason exists therefore, revoke any reference to such a board," and it prescribes the procedure for joint hearings. Such powers may make co-operation on the part of the private utility difficult.

Meetings

National Electrical Contractors Association — Annual convention, Atlanta-Biltmore Hotel, Atlanta, Ga., October 12–14. L. W. Davis, secretary, 420 Lexington Ave., New York, N. Y.

National Battery Manufacturers Association—Annual convention, Hotel Sherman, Chicago, Ill., October 15–16. W. J. Parker, National Battery Manufacturers Association, 7 East 44th Street, New York.

American Welding Society — Annual meeting, Cleveland, Ohio, October 19–23.

American Institute of Electrical Engineers—Southwest District, Dallas, Tex., October 26–28. H. H. Henline, national secretary, 33 West 39th Street, New York.

American Physical Society — Annual meeting, New York, N. Y., October 29–31. W. L. Severinghaus, secretary, Columbia University, New York, N. Y.

National Association of Railroad and Utilities Commissioners — Annual convention, Atlantic City, N. J., November 10–13. Clyde S. Bailey, secretary, 806-808 Earle Building, Washington, D. C.

American Society of Mechanical Engineers—Annual meeting, New York, N. Y., November 30–December 4. C. E. Davies, national secretary, 29 West 39th Street, New York, N. Y.

National Exposition of Power and Mechanical Engineering — Grand Central Palace, New York, N. Y., November 30–December 4.

Convention Precedes Springfield Voting

The entire national interest in municipal ownership will be brought to bear on the local situation at Springfield, Ill., for three days during the week previous to that city's poll on the question of the municipal power department's purchase of the private company.

The Public Ownership League of America will hold a three-day conference at Springfield beginning October 15. On October 20 citizens vote on the $7,200,000 purchase of the Central Illinois Light Company in Springfield and for adjoining rural territory, and of the local heating system.

Holding the conference there at that time appears to be the *coup d' état* of the veteran municipal ownership advocate, Willis J. Spaulding, who is both commissioner of public property in charge of Springfield's municipal plant and president of the national ownership league.

•

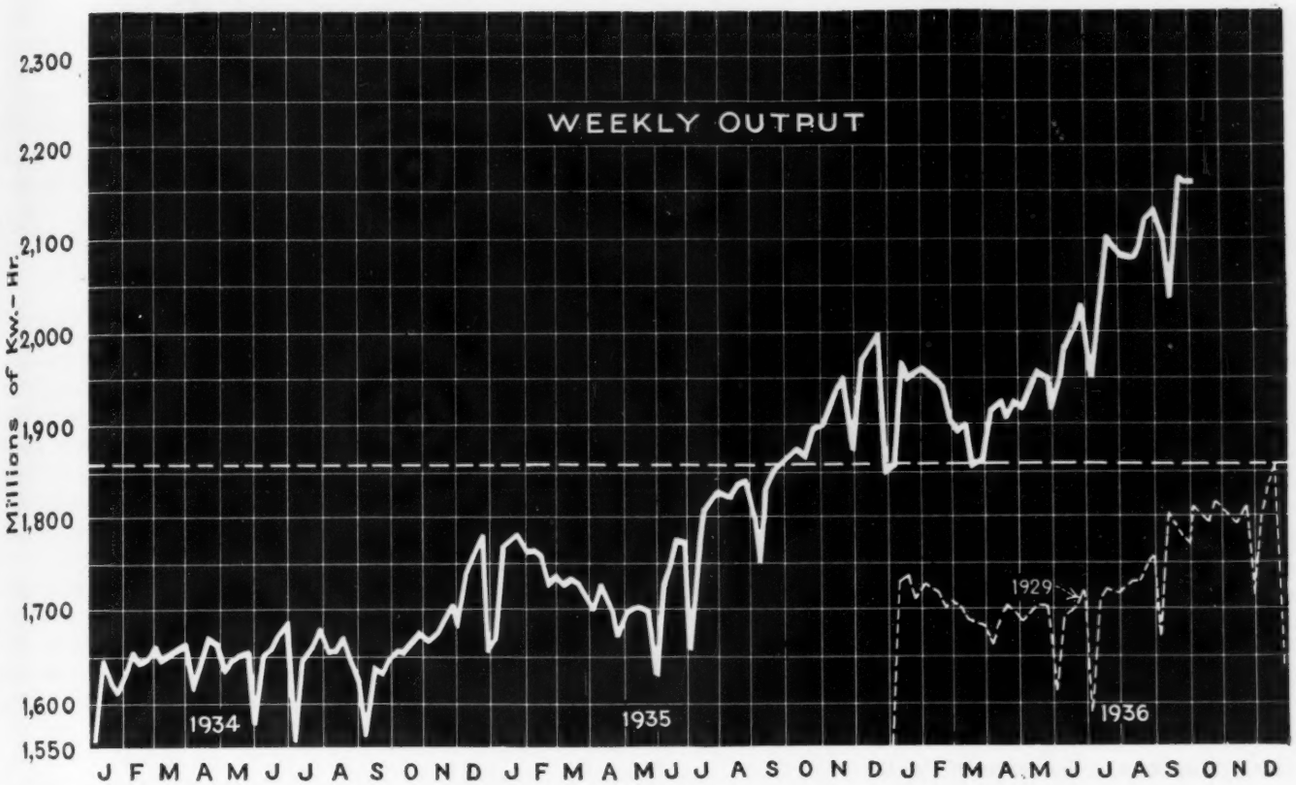
Foreign Steam Plant Uses New Principle

The I. G. Farbenindustrie has just completed a new type of steam plant at Leverkusen, Germany, which will produce electricity at $0.002 per kilowatt-hour, according to information received in this country.

This plant, rated at 250,000 hp., is said to be the only one of its kind in the world. It has a vertical boiler with tubes between 75 and 100 ft. long. The principal feature of the plant is that there is no water in the fire box. The tubes, instead of water, contain steam, which is drawn off the head of the tubes at 1,000 lb. pressure and pumped again to the bottom of the tubes, where pressure runs about 2,000 lb. It is said that in no other plant in the world is steam pumped at such pressure.

The boiler burns powdered coal at a temperature of 500 deg. C., working pressure 135 atmospheres. It is equipped with Cottrell precipitators and has no smokestacks. There is no fly ash and it gives off no combustible matter.

Energy Output 16.4 per Cent Over 1935



Virtually matching the all-time peak recorded a fortnight ago, with the production of 2,169,442,000 kw-hr., central station energy output during the week ended October 3 surpassed that of a year ago by 16.4 per cent, according to figures announced by the Edison Electric Institute. Compared with the preceding week there was a slight rise. The upward movement, normal for this time of the year, continues to be parallel with the vigorous climb in the autumn of 1935 but on a much higher level and the excess over 1929 persists around 20 per cent.

Regional gains over last year show little change in recent weeks. The South leads with 22.1 per cent, followed by the Central Industrial region with 18.1 per cent and the Mountain States with 16.0 per cent. In the Pacific States the margin has tended to increase.

Weekly Output, Millions of Kw.-Hr.

1936		1935		1934	
Oct. 3	2,169	Oct 5	1,863	Oct. 6	1,659
Sept. 26	2,157	Sept. 28	1,857	Sept. 29	1,649
Sept. 19	2,171	Sept. 21	1,852	Sept. 22	1,631
Sept. 12	2,029	Sept. 14	1,828	Sept. 15	1,634
Sept. 5	2,099	Sept. 7	1,752	Sept. 8	1,565
Aug. 29	2,135	Aug. 31	1,810	Sept. 1	1,627

Per Cent Change From Previous Year

Region	Week ended Oct. 3	Sept. 26	Sept. 19
New England	+12.8	+11.6	+16.1
Middle Atlantic	+14.8	+14.8	+16.4
Central Industrial	+18.1	+17.8	+19.5
West Central	+12.6	+ 9.4	+13.0
Southern States	+22.1	+23.8	+23.3
Rocky Mountain	+16.0	+15.6	+16.7
Pacific	+12.0	+10.0	+ 8.9
United States	+16.4	+16.1	+17.2

Manitoba to Export Power to U. S.

Transmission of power over Manitoba Hydro system lines into the United States, for distribution to points in North Dakota, shortly will place the province in the hydro electric export field. The export is sanctioned by the Dominion Government, which restricts the quantity to 1,000 kw., Herbert Cottingham, chairman of the Manitoba Power Commission, said.

Erection of a half-mile extension to present distribution lines at Gretna will connect with the interstate power lines at the international border line. Arrangements are being made to supply several North Dakota towns adjacent to the boundary line, Mr. Cottingham said. The interstate company is constructing lines to connect with the Manitoba Hydro at Neche. It is expected other North Dakota towns along the border also will receive provincial power.

To Vote on Utility Purchase

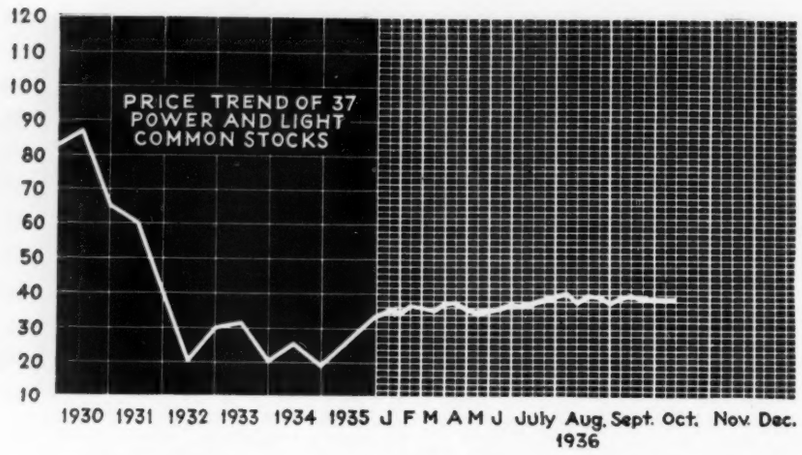
City Council has voted, 13 to 1, to place a charter amendment before voters at special election, December 8, which would provide necessary machinery to purchase, for $46,300,000, the electric properties of Los Angeles Gas & Electric Corporation. The utility had tendered the city an option. (*Electrical World*, October 3, page 18).

Energy Sales Mount

Gains comparable with those of the vigorous growth a decade ago are indicated by the July revenue from ultimate consumers of the electric light and power industry, as announced by the Edison Electric Institute. Amounting to $167,671,900, it exceeded the corresponding figure for 1935 by 10.9 per cent. Energy sales to ultimate consumers rose 20 per cent to 7,519,-103,000 kw.-hr.

During the year the installed generating capacity increased by 400,000 kw., customers by 500,000. Average annual consumption per domestic customer for the first time exceeded 700 kw.-hr.; and the average rate for the twelve-month period dropped to 4.84 cents.

Utility Stocks Gain Ground



Strength in the stock list was fairly general this week and light and power stocks share in the advance. "Electrical World" index, 39.2; last week, 38.5

General Gas Offers New Preferred Stock

General Gas & Electric Corporation, parent company of Southeastern Electric & Gas, Broad River Power, Lexington Water Power and Florida Public Service, has submitted to stockholders a plan for liquidating most of the corporation's debt obligations and improving the position of preferred-stock holders.

New $5 prior preferred stock would be created exchangeable, by public holders only, for present holdings of corporation's $6 preferred, $7 preferred and $8 preferred. New $5 issue would be placed on an immediate dividend basis as of September 15.

The liquidated debt feature of the plan consists of an exchange for preferred stock of the corporation at the rate of $100 per share.

Upon completion of the plan, dividends on the new $5 issue would be covered more than 3.8 times, based on earnings for twelve months ended August 31, 1936.

•

Twin State Gas Note Issue Allowed

Using its discretionary powers under the Public Utility Act of 1935, the S.E.C. has granted permission to the Twin State Gas & Electric Company, which operated in Vermont, New Hampshire and New York, to issue, without public offering $2,305,250 of promissory notes to mature in not more than nine months, although the outstanding notes and drafts will exceed in the aggregate 5 per cent of the principal amount of the borrower's other outstanding securities.

In its order the S.E.C. said that the issue of notes was the first step in a plan looking to the early liquidation and dissolution of the applicant through the sale of all or substantially all of its properties to utilities. The impending liquidation, the commission explained, made the issue of notes, instead of long-term financing, appropriate in the case of Twin State.

•

Check Is Issued for $42,000,000

A check for $42,115,875, the largest ever written by a Kansas City concern, has been turned over to the Continental National Bank and Trust Company of New York as a part of a bond refunding operation by the Kansas City Power & Light Company, Chester C. Smith, vice-president, revealed.

The check covered the refunding of $38,000,000 of 4½ per cent coupon bonds the power company called in for redemption, as of October 2, at the call price of $110. The check was signed by Joseph F. Porter, as president and Mr. Smith as treasurer. The check represented the par value of the $38,000,000 additional required to call them in and accrued interest from the last coupon date to October 2.

To obtain the money required for the refunding operation the Kansas City company issued $38,000,000 of first mortgage 3¾ per cent series bonds due in 1966 and sold them at $109.25 at private sale to eight insurance companies and two large savings banks. To the company the refunding transaction will bring a saving of $285,000 annually in interest charges.

•

Calling Preferreds Means Added Savings

Recent action of the Rochester and Central Hudson companies leading to calling preferred stock issues and offering preferred with lower yields is the newest measure taken to meet the inroads upon net earnings made by successively lowered rates for electric service.

The wave of bond refunding continues along a broad front and companies in good financial position have been able to refund at rates low enough in one case at least to halve interest charges.

Unfortunate exceptions are those companies subjected to competition from government power projects.

In the struggle for net earnings many of the forward-looking utility managements are studying the possibilities of calling 6 and 7 per cent issues of preferred stock and offering 4 and 5 per cent securities with the same cumulative, call and voting characteristics.

At present the analyses are confined strictly to the inner circles as preferred-stock holders are beginning to object to the exercise of the callable privilege and the substitution therefore of preferreds carrying an interest rate which may be 2 per cent below the income to which they have become accustomed.

•

Byllesby Management Votes Name Change

The board of directors of Byllesby Engineering & Management Corporation has voted to change the name of the organization to Public Utility Service Corporation and elected B. W. Lynch as president of the new corporation, succeeding the late John J. O'Brien. Mr. Lynch is also president of Standard Gas & Electric Company.

The Byllesby Engineering & Management Corporation was organized in 1919.

Manufacturing AND MARKETS

Electrical Sales Up

Manufacturers' sales of electrical equipment, apparatus and supplies during August were 18.8 per cent larger than they were a year ago, it appears from figures announced by the Department of Commerce. The gain is computed from returns made by 20 companies. It is slightly above the average for the entire group of 528 companies in various branches of manufacturing, which amounted to 18.4 per cent. Collections also show an improvement. Other comparative data for the electrical group are as follows:

Sales, August, 1936	$16,761,000
August, 1935	14,105,000
July, 1936	19,138,000
Change from August, 1935, per cent	+18.8
Change from July, 1936, per cent	—12.4
Per cent of collections during month to accounts receivable at beginning of month: Aug., '36, 87.7; Aug., '35, 86.0; July, '36, 84.0.	

Corresponding figures for wholesale trade in electrical goods are—

Number of firms reporting sales	78
Sales, August, 1936	$7,505,000
August, 1935	6,259,000
July, 1936	8,619,000
Change from August, 1935, per cent	+19.9
Change from July, 1936, per cent	—12.9
Number of firms reporting collections	27
Per cent of collections during month to accounts receivable: Aug., '36, 82.0; Aug., '35, 83.5; July, '36, 84.5.	

•

General Electric's Orders Up 38 Per Cent

Orders received by the General Electric Company during the third quarter of 1936 amounted to $74,922,441, compared with $54,400,819 during the third quarter of 1935, an increase of 38 per cent, it was announced this week by President Gerard Swope.

Orders received during the nine months amounted to $211,891,038, compared with $158,943,765 during the nine months last year, an increase of 33 per cent. Orders received during the third quarter and first nine months of this year were larger than for any respective period since 1930.

•

Cutler-Hammer Opens Pacific Coast Plant

Cutler-Hammer, Inc., Milwaukee, Wis., announces the extension of its manufacturing facilities to the West Coast. A new plant, at 970 Folsom Street, San Francisco, Calif., began operation in September. Other factories are located in New York City and Milwaukee. Special control constructions, dead-front switchboards, fuse cabinets and panelettes, panelboards, transformer cabinets and wiring troughs are being manufactured under the direction of R. R. Crooke, who has had more than 30 years' experience in the production of this type of equipment. F. H. Oberschmidt is manager of the Pacific Coast district.

"Turkey-Time" Drive Opened by Hotpoint

A "Turkey-Time" sales campaign, designed to give utilities and dealers a complete day-by-day pattern of sales activity for the active Thanksgiving and Christmas selling seasons, has been released by Hotpoint for the final drive of 1936 on electric range sales. The campaign completes Hotpoint's 1936 program of load building for utilities, during which five complete seasonal sales campaigns have been prepared and used by public utility companies throughout the entire country.

The "Turkey-Time" campaign urges salesmen to tell the public about "better cooked Thanksgiving turkey, cooking to delicious doneness on the electric range." For the Christmas season the selling theme again is "What Mother Really Wants—An Electric Range," which has been used

SHOWS WHAT IT DOES — For visitors to Rhode Island's Industrial Exposition at Providence, Narragansett Electric Company gathered these products of local manufacturers, customers of the company, using electric heating. Displayed near each product are photographs of the electric heating installation producing the product

successfully for 8 consecutive years.

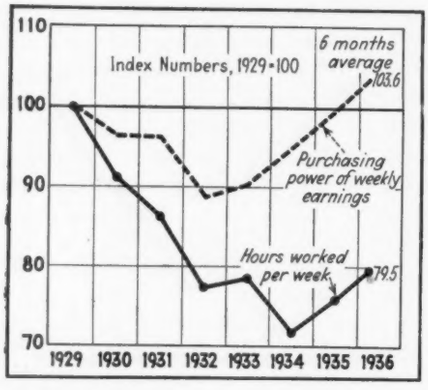
A complete new advertising and sales promotional program supports the central theme of both the Thanksgiving and Christmas campaigns.

•

Purchasing Power Over 1929

Purchasing power of average weekly earnings of wage earners employed in manufacturing industries is higher today than in the boom year, 1929, while average weekly working hours are shorter. These facts are brought out in an analysis of manufacturing statistics made public by the National Industrial Conference Board.

The current higher purchasing power of wages is accounted for



Purchasing power of average weekly earnings and average hours worked per week Manufacturing Industries, 1929–1936

chiefly by the fact that weekly money earnings have advanced more rapidly than the cost of living. For the first six months of 1936 the average cost of living index, taking the average for 1929 as 100, was 83.7, and the index of average weekly money earnings was 86.7. This gave an index of "real" earnings of 103.6, or 3.6 per cent above the 1929 level. Average hours worked per week in the first six months of 1936 were 38.4, as compared with 48.3 in 1929.

New York Metal Prices

	Oct. 7, 1936 Cents per Pound	Sept. 30, 1936 Cents per Pound
Copper electrolytic	9.75*	9.75*
Lead, Am. S. & R. price	4.60	4.60
Antimony	12.75	12.50
Nickel ingot	35.00	35.00
Zinc spot	5.225	5.225
Tin Straits	45.25	46.00
Aluminum, 99 per cent.	19—21	19—21

* Delivered Connecticut Valley.

Field Reports on Business

Reports to ELECTRICAL WORLD *from the field during the past week have been of an encouraginng nature. A significant item in the recent trade news is the jump in railroad carloadings to a six-year record. Constant expansion in the buying of steel products is recorded, with prospects for still higher output late this month and in November. A steady increase in business borrowings is indicated by the growing loans of banks.*

NEW ENGLAND

Reports from consulting engineers and architects disclose considerable activity over the drawing boards in this district and the likelihood of expansion of power plants and a strong trend in buying of electrical equipment during the remainder of the year. Industry in this section is moving vigorously; small motor buying is steady and switch and control equipment is being bought in good volume. Central stations are increasing their purchases; recently orders amounting to about $20,000 consisting principally of carrier current control apparatus for a transmission system, were placed by a well-known manufacturer.

Electric arc welders are attracting interest and sales recorded by one representative include four units, three of which were rated at 150 amp. and the fourth at 200 amp. placed with a Maine manufacturer. Inquiries for lighting equipment are strong; factory lighting is active; a prominent consulting engineering firm recently completed the plans for lighting a large group of textile mills at a cost of about $50,000. Street lighting is gaining and sales of standard street illumination units are brisk. The General Electric Company factories at Lynn, Mass., are starting work on a lighting system for Lima, Peru, the lamps to be of the sodium type.

Supplies for air conditioning are progressing; installations of air-conditioning equipment for restaurants are gaining. Merchandising sales are promising; some specialties, according to one well-known distributor, are in good demand, particularly electrically operated laundering machines. Sharp advances are recorded in the sales of small domestic appliances. Range sale campaigns are stimulating buying. The past month closed with sales over 50 per cent ahead of last year for one well-known New England distributor. Boston Edison has added four power salesmen.

CHICAGO

Business was content last week to hold fast to the level of the preceding week, thereby solidifying an already intrenched position. The final quarter of the year was entered with virtually every major line on a high plane of activity. Optimism prevails on all sides as the biggest fall and winter turnover since 1929 is foreseen for the coming months.

The upward trend in the recovery of the railroads seemed destined to continue as several large orders were placed for locomotives, coaches and freight cars. Particularly encouraging was the announcement of the largest industrial construction project in this city for several years—a nine-story, two-million-dollar air-conditioned plant, scheduled for immediate construction. Retail and wholesale trade continued to display exceptional vitality.

Lighting business is especially good, a number of large installations in office buildings contributing materially to the total. Change-over to more modern fixtures in stores has resulted in some nice orders. Radio sales are excellent and appliances are moving more rapidly. Central station supplies show signs of picking up. Several good-sized orders were reported for transformers, motors, switches and conduit. An order was placed for 110,000 ft. single-conductor No. 8 A.W.G. 5,000-volt flexible, steel-armored cable.

NEW YORK

Stimulated by the upturn in retail trade, large general merchandise shipments are being made from New York to the Middle West and far West. Automobile shipments in the next few weeks will be heavy as the auto show week draws near. While no definite figures are yet available on building construction contracts in September, present estimates are that the total will show a sharp increase over the previous year.

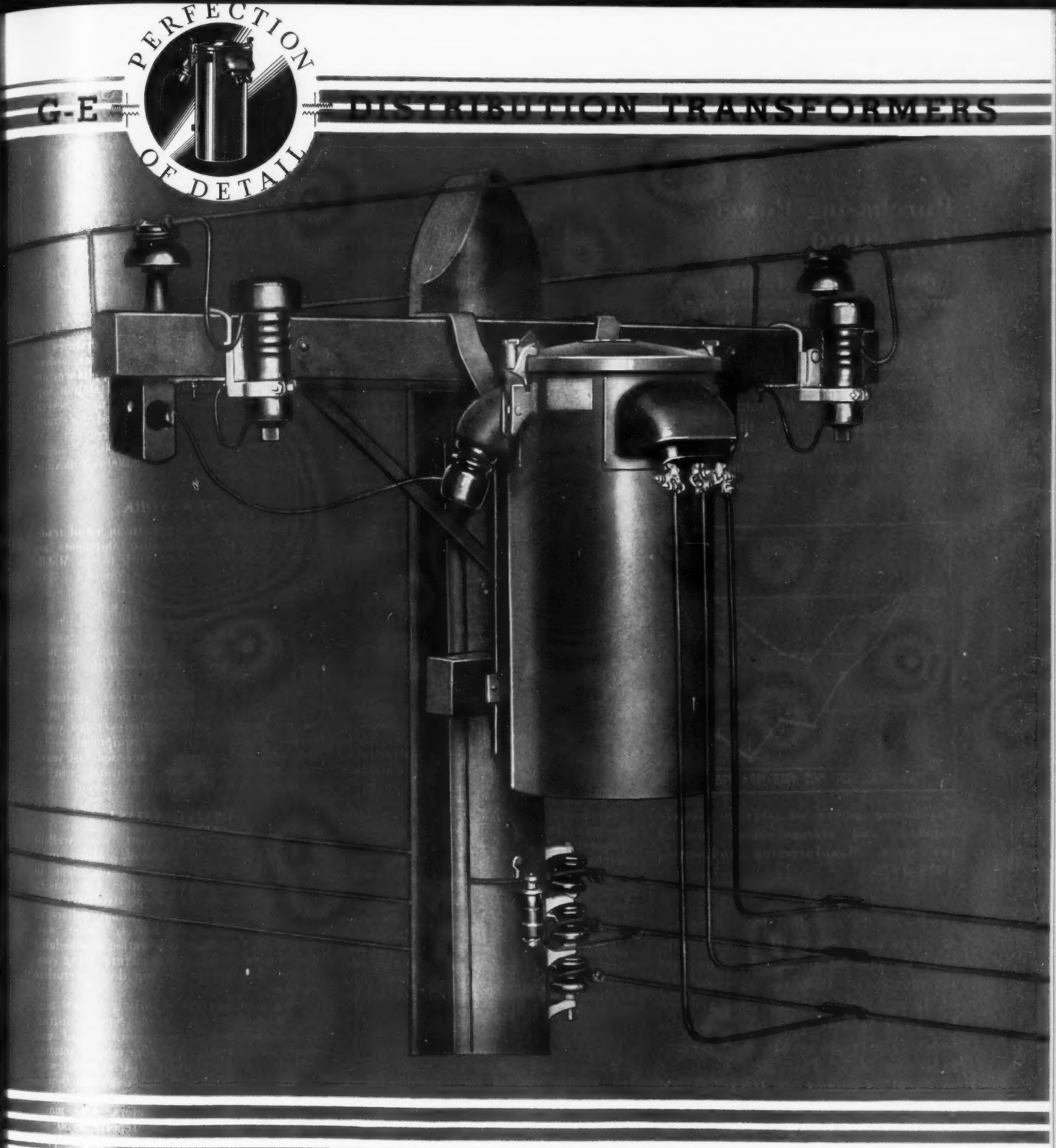
Sales of domestic electrical appliances are expected to register substantial gains during the next few months over last year's totals. Demand for this equipment so far this year has materially exceeded last year's and the peak volume, as usual, can be expected during the holiday period.

PACIFIC COAST

Power companies report an excellent September energy demand. Much quiet electrical investigation is being done in the Bay area in preparation for housing and entertaining the prospective 1939 exposition attendance. Two million dollars of fair construction is actively under way. Bay Bridge opening celebration is scheduled for November 12, the structure being completed then except for top deck interurban railway.

One manufacturer reports a $15,000 mining machinery sale in the Sonora district, comprising transformers, switchboard and condensers, and two dredge outfits totaling $20,000 in the Oroville district. Statewide power line extension and reconstruction is reflected in statewide shipments of distribution transformers and meters. One manufacturer's Oakland plant reports a 50 per cent increase in the average rating shipped now over that of a few years back, or 11 kw. as compared with 7 kw., and that its maximum motor rating manufactured there is 150 hp., as compared with 50 hp.

A 40,000-acre-ft. dam is to be constructed at Boca, 20 miles west of Nevada state line, by the government reclamation service to handle two Nevada irrigation districts and additional storage for Sierra Pacific Power Company. The successful bid was approximately $730,000. Prices are fairly steady, with urgent orders checking the spring tendency to minimum price quantity orders. Collections are distinctly better and the proportion of collections to outstanding accounts has improved 10 per cent.



"TOPS" IN SERVICE

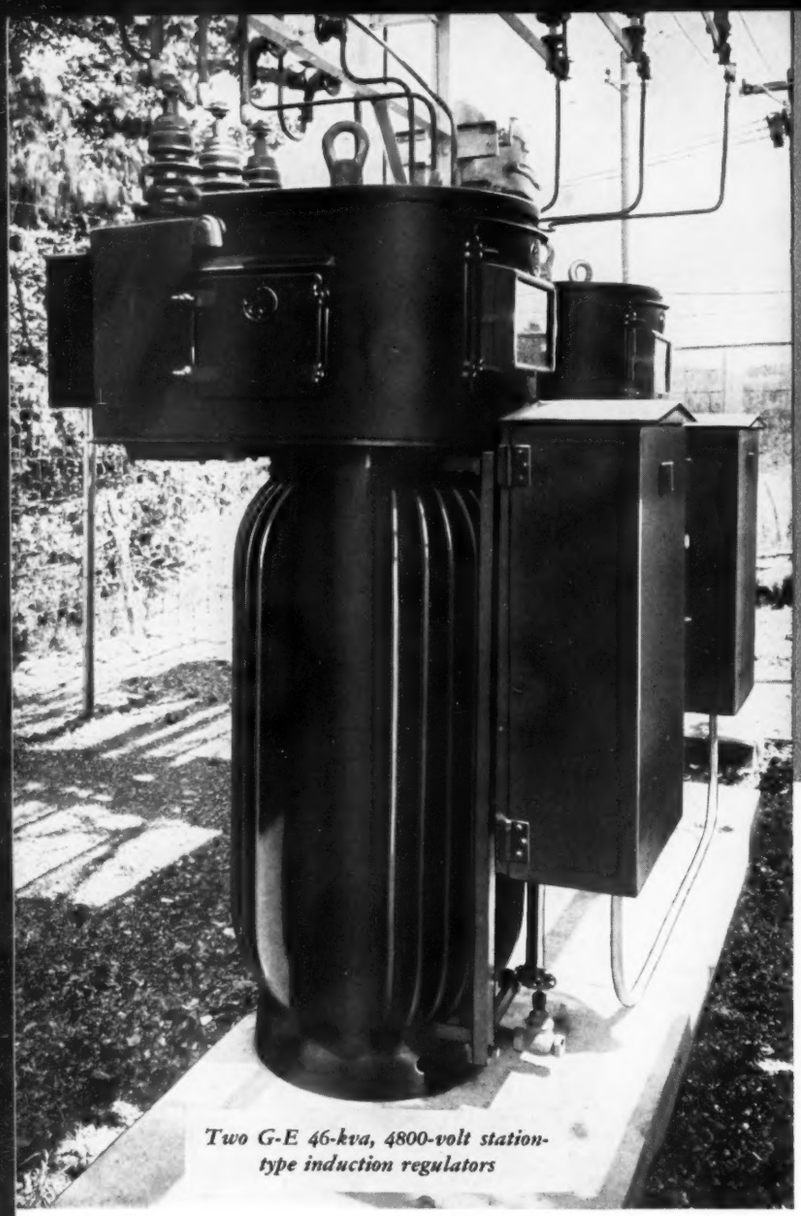
The highest standard of service and flexibility of application are yours when you install G-E Type H distribution transformers. Sound engineering design of their electrical and mechanical characteristics, combined with painstaking construction of the transformer, and good operating practice on the part of the utilities, have been responsible for almost inconceivably good operating records. It is this record which assures you long transformer service and low operating cost.

G-E Type H transformers installed with G-E pellet arresters (using interconnection) and G-E enclosed and indicating fuse cutouts have for years demonstrated their ability to provide the maximum degree of service continuity. General Electric, Schenectady, N. Y.

300-44

GENERAL ELECTRIC

Filing No. 5100



Two G-E 46-kva, 4800-volt station-type induction regulators

PROBLEM

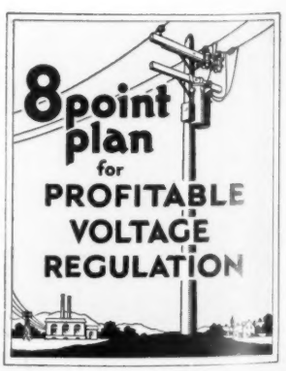
WHAT estimate would you place on the value of these two G-E induction regulators to the operating company which installed them at a cost of $4,200?

THE APPROACH

TWO factors should be considered for solution. The first, tangible, is that the regulators prevent the loss of 40,000 kw-hr of revenue annually—at five cents per kw-hr. The second, intangible, is that by maintaining voltage at the proper levels, service is improved, good customer relationships are maintained.

These Are The REGULATORS That Are Returning 47 PER CENT on the Investment ANNUALLY

WE have investigated the case histories of a large number of G-E regulators on the lines of various operating companies. In each case the details vary, but the pattern remains the same—regulation with G-E equipment provides one or more of the following advantages: a profitable investment; a saving in capital investment over other methods of regulation; improved service. G-E has a complete line of regulators, for every point on the system. Ask for GES-1142A. General Electric Co., Schenectady, New York.



350-128

GENERAL ELECTRIC

Field OPERATING PRACTICES

New ideas and practices in the operation of well-designed, constructed and maintained plants and systems

Polarized Control for Street Lights

By A. S. BROOKES
Public Service Electric & Gas Company, Newark, N. J.

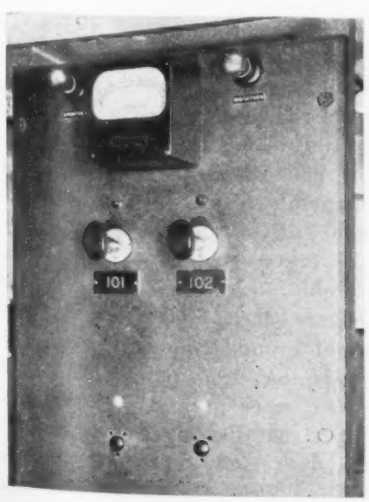
Multiple street lights in a mile-long stretch in Bayonne, N. J., are turned on and off by the local substation operator, who simply closes momentarily a small double-pole, double-throw reversing switch. This switch, which, with an ammeter and indicating light, is mounted in the substation on a panel half the size of the average desk top, applies station battery potential of 120 volts d.c. for a few seconds between a pilot wire and ground. Under the action of the resulting d.c. impulse individual polarized controllers at each street light fixture apply or remove secondary network voltage from the lamp, depending upon the polarity of the impulse sent out.

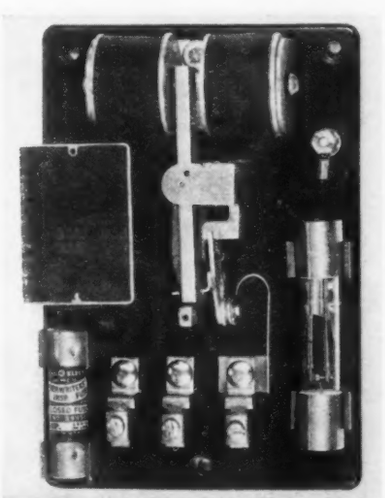
This system of street light control was developed by engineers of the Public Service Electric & Gas Company, Newark, N. J. The controller used consists essentially of a polarized relay with the contacts so arranged that they will remain definitely in the open or closed position, depending upon the polarity of the impulse last received. The operating current is about 60 milliamperes for controllers situated near enough the substation to receive full battery voltage, although reliable operation may be obtained with as little as 30 milliamperes.

Since the primary neutral in use in this territory is multi-grounded, it was necessary to use a No. 8 rubber-covered pilot wire to carry the control impulse. Where a three-phase, four-wire system with the neutral grounded only at the substation is used, however, the control impulse can be sent out over the primary neutral. This is done by momentarily opening the neutral grounding switch and applying the voltage across it. Where it is considered inadvisable to unground the station neutral a resistor of adequate capacity can be connected across the grounding switch.

The Bayonne installation has 96 422-watt lamps spaced 100 ft. on each side of the street with the two rows staggered. There are three other circuits in operation on the system with a total of 236 527-watt lamps, 76 of these being on double light standards. Other circuits are under construction. None of the existing circuits have the maximum number of controllers possible for the size wire used. The limiting number of lights is, of course, determined by the lamp spacing and the size of the pilot wire.

The simplicity and flexibility of this system lends itself readily to the majority of multiple street light systems and makes possible its application to off-peak load control as well, although this has not as yet been attempted.





Compact polarized controllers permit operation of multiple street lights from compact substation panel

•

Distribution Maps Cheap per Customer

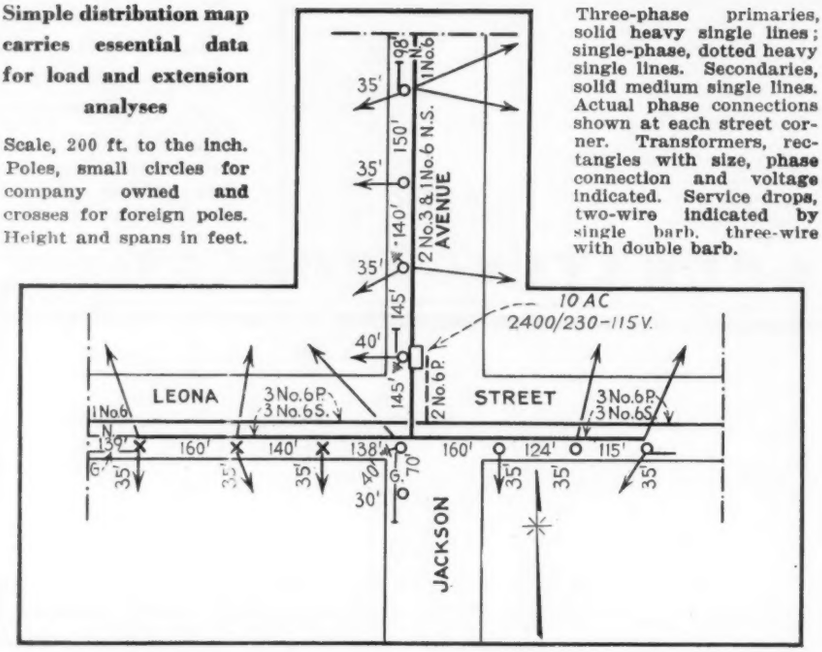
By W. W. PALMER
Columbus, Georgia

Cost of making distribution maps can be cut surprisingly by limiting them to the purposes for which they are intended. Actual costs for such a set of maps showing 19,500 customers made by regular employees has been found to be 22 cents per customer. By contract it should be possible to cut this to 18 cents per customer. Such a procedure would avert the necessity of adding to company staff and at the same time afford temporary employment for competent electrical draughtsmen and field mappers. There would be the incentive of piece-work payment, field costs would be less, so would overhead and tie-up of transportation and office space.

Based on known costs when done by

Simple distribution map carries essential data for load and extension analyses

Scale, 200 ft. to the inch. Poles, small circles for company owned and crosses for foreign poles. Height and spans in feet.



company staffs the schedule under contract gangs (field recorder and two chainmen) should be about as follows on a monthly basis:

Personnel ($125, $100, $18)	$243
Subsistence (2 men)	38
Automobile expense	16
Drawing materials	6
Incidentals	7
Total	$310

At 18 cents per customer this would produce finished drawings showing 1,720 customers per month. Allowing 24 eight-hour days exclusive of travel time, the crew would provide 256 man-hours for drafting and 64 gang-hours for field work. Lines would be covered at the rate of 215 customers per day for the eight days in the field.

The map sample shown presents adequate information for the following uses and in general any supplementary information would cost more than it is worth for extension purposes:

1. Analysis of extensions or enlargements to serve new loads.
2. Correction of voltage conditions.
3. Phase and line load-balance.
4. Transformer loading.
5. Emergency repairs.
6. Availability of specific types of service for prospective customers.

Installation Permits Ground Rod Economy

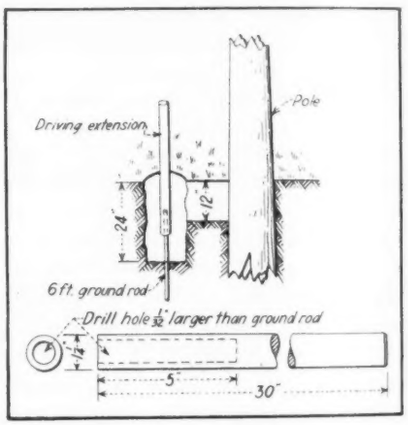
By TRUEMAN T. SMITH
Engineering Department,
Puget Sound Power & Light Company,
Seattle, Wash.

Maximum utilization of the effectiveness of a ground rod has been obtained by a new method of installation employed by the Puget Sound Power & Light Company. Many utilities install ground rods with the top about 6 in. beneath the surface of the ground largely to prevent any one from tampering with the connection. Instead of digging a hole 6 in. deep, the Puget Sound Power & Light Company uses a hole 2 ft. deep with a 6-ft. ground rod driven to the bottom of this hole. Thus a 6-ft. ground rod becomes as effective as an 8-ft. ground rod driven flush with the ground. This method of installation eliminates the resistance of the first 2 ft. of earth, which generally is so high that it has practically no conductivity and may be disregarded.

Cost for digging a 2-ft. hole is small as the top soil ordinarly is loose and easy to work. The slight extra cost is offset by having to drive only 6 ft. of rod instead of 8 ft. and by virtue of the safer and easier working position which permits the driver to stand on the ground. This, incidentally, speeds up the driving also.

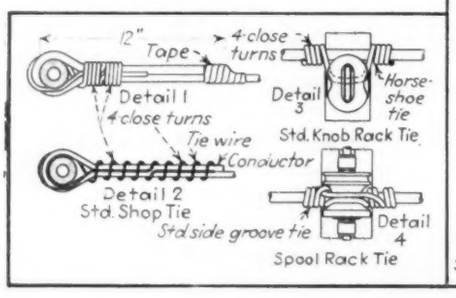
When the 6-ft. rod is driven nearly flush with the ground a driving extension is needed to continue. This can be made easily and economically by drilling a hole slightly larger than the diameter of the ground rod in the end of an old automobile rear axle. The extension is placed over the end of the rod and the driving continued. Its weight absorbs some of the vibration and speeds the driving. The automobile rear axle was chosen because it can withstand heavy blows.

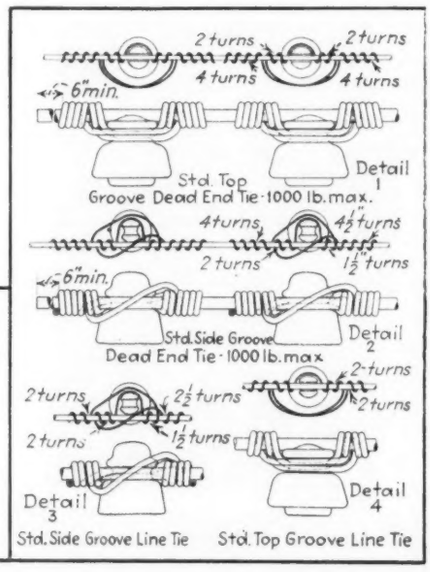
As the cost of a 6-ft. rod is considerably less than the 8-ft. rod, economy can be effected with no sacrifice of ground conductivity. As the cost is low, it is quite possible that two or more ground rods might be used in parallel in cases where high ground resistance is encountered, something which might not otherwise be done where an 8-ft. ground rod was used alone.



Driving extension facilitates placing a 6-ft. ground rod 2 ft. below the surface where maximum effectiveness is assured

TYPES OF TIES USED BY DETROIT EDISON COMPANY





SIMPLICITY OF DETAIL
STRENGTH CONSTRUCTION
SAFETY OPERATION

The Type FLO . . . . . A New Outdoor Oil-Blast Breaker

IN this new G-E breaker you get these important features:

Simplification of mechanism—more than forty-five parts have been eliminated when compared with the conventional type—simple, direct, positive action.

Heavy-duty interrupting contacts with long-life arc-resisting surfaces. They are made to withstand frequent repeated operations—low maintenance.

Silver-to-silver main contacts that do not require periodic cleaning to keep them cool—better continuity of service.

Oil-blast—that reliable consistent interrupting principle.

Install the FLO in your distribution lines for automatic reclosing and keep your electric-service outages to the minimum. It is available in ratings from 50,000 to 175,000 kva, at 15,000 volts.

Manually or electrically operated—Double or triple pole for framework or pole mounting.

890-9

GENERAL ELECTRIC

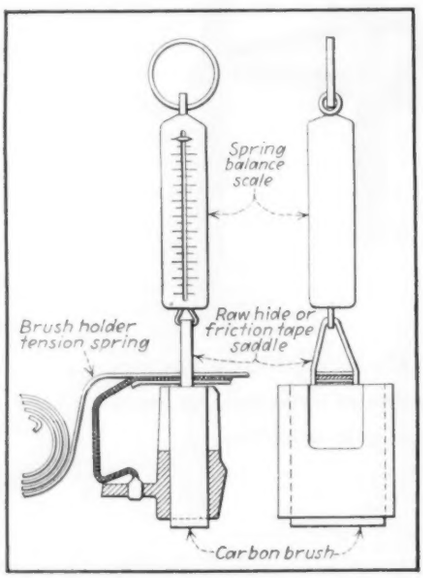
Industrial ELECTRIFICATION

New ideas and practices in industrial electrification as presented by industrial, consulting and power sales engineers

Measure Brush Force With Spring Scales

By JOHN S. DEAN
Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Measurement of brush-holder pressure can readily be made by using a spring balance scale. These scales can with very little expense be modified by a shop mechanic to make them more suitable for this work by replacing the hook at the one end with a small leather stirrup. If this is not done, it is suggested that a short loop of friction tape be used between the hook on the scales and the pressure finger on the brush-holder. Either of these arrangements makes it possible more securely to grip the pressure finger when lifting same to measure the spring pressure.



Spring balance registers brush pressure
Measure directly over the carbon when the contact tip is at the top of the brush-holder box and with the spring balance held parallel with the brush.

While making these measurements pay particular attention to the following:

1. Place the saddle or loop of friction tape on the pressure finger directly over the top of the brush at the center.
2. Pull in a straight line, parallel with the brush, as shown in the sketch, and not at an angle.
3. Measure the tension when the contact tip on the pressure finger is in a position corresponding to the top of a new brush.
4. The tension on brush-holders on the under side of a commutator or collector should be increased by a value equal to the weight of the brush being used.
5. See that the tension on the various types of machines is adjusted to the following values:

Types of Machines	Lb. Tension per Square Inch Cross-Section of Brush
General purpose d.c. motors and generators	2
General purpose a.c. motors	2.8 to 4
Crane type motors	3½
Railway type crane motors	4½
Mill type motors	4½
Rotary converters—commutating end	2 to 2½
Rotary converters—collector end	2½ to 3
Large low-speed power machines	1½ to 2½
Large induction motors	2½ to 3½

Electric dredge "Calumet" gets to work

Use Double Motor for Dredge Drive

By JEAN M. ALLEN
Jean M. Allen & Company, Chicago, Ill.

Installing two synchronous motors on a single shaft is one way to provide two operating speeds for a centrifugal pump, but any engineer seeing such a set-up must immediately ask why. Why not a variable or a multiple-speed induction machine? There are two 4,000-volt, 1,500-hp. synchronous motors, one of 360 r.p.m. and the other 450, on the main pump drive of the dredge *Calumet*, which is now working on the federal project of deepening and widening the Little Calumet River south of Chicago. This stream connects Lake Calumet with the Sag Canal and is a link in the Illinois waterway system between the Great Lakes and the Mississippi River. The dredge has a capacity of from 16,000 to 20,000 cu.yd. daily.

Dredge pump drive is peculiar in

Exide

CHLORIDE BATTERIES

UNSURPASSED for LIFE and SERVICE

There are quite a number of square feet of active material contained in those strips of corrugated lead which, rolled into compact rosettes, distinguish the Manchester positive plate from all other makes. Likewise, the lead boxes which contain the active material of the negative plates, are equally distinctive—and long lived.

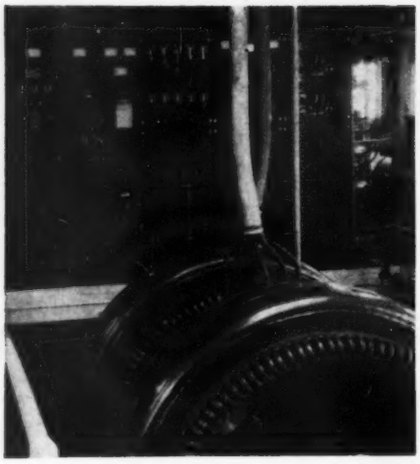
In conjunction, properly spaced by board and rubber dowel separators and assembled in sealed glass jars, they comprise the most dependable, powerful and long-lived cell ever designed for stationary service.

And if any doubt exists as to the merits of this Exide-Chloride Battery, one has only to study the list of public utilities, private power plants, telephone and railroad companies—all over the world—that have been using these exceptional batteries for more than forty years.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

The World's Largest Manufacturers of Storage Batteries for Every Purpose

Exide Batteries of Canada, Limited, Toronto



Two synchronous motors supply 450- and 360-r.p.m. pump speeds

that it must be started slowly. It is not possible to slam the motor on the line and let it come up to speed as quickly as the load will allow. The dredge discharge pipe is of comparatively light construction, is usually long and often includes a number of bends and curves. It is not a strong enough structure mechanically to withstand the strain of the rush of water in the empty pipe that would result from ordinary motor starting. The pipe must be filled slowly, and this means that a time of two or three or even up to five minutes must be given to starting the pump. Also, the pump works against zero head as it starts and might very readily put an inordinate load on the motor driving it. For this reason the squirrel-cage motor is obviously unsuitable for dredge drive and the wound-rotor type has heretofore occupied the field practically without challenge.

But the slow-speed slip-ring motor usual in dredge drive has the deficiency of low power factor and low efficiency when operated at reduced speed, as is frequently desirable when the dredge discharge pipe is comparatively short. This condition is usually improved by changing to a smaller pump impeller, which, driven at normal motor speed, is sufficient to maintain the rated dredge capacity in g.p.m. discharge. Changing impellers consumes considerable time, and consequently a dredge pump is frequently run at reduced speed on resistance, resulting in a considerable loss of power and efficiency. But it was felt that greater flexibility and better performance than this could be attained, and out of considerable thought and figuring finally came the idea of using two synchronous motors of different speeds.

Use of synchronous motors abolished the problems of low efficiency and low power factor. Two pump impellers plus two motor speeds gave four highly efficient operating conditions, adequate for any length discharge pipe that might be used, The motors themselves had to be rather special. They were designed by the Elliott Company, from long experience in the supply of dredge drives, with 175 per cent pull-out and correspondingly high pull-in torque. Also, the starting torque was more than doubled from ordinary design. For the high starting torque and for the essential requirement of slow starting special control equipment had to be provided. This was supplied by Cutler-Hammer and consists of a magnetic, reduced-voltage, resistance type starter, including a five-point drum master switch and with the rate of motor speed acceleration automatically controlled by mercury orifice timing relays.

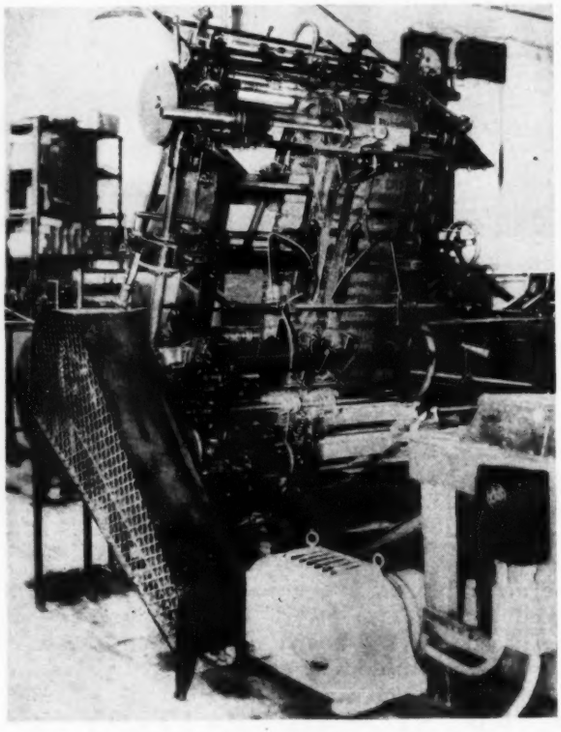
In addition to the two 1,500-hp. synchronous motors there is another 4,000-volt drive on the *Calumet*. This is a 500-hp. (700-hp. half-hour rating), slip-ring motor driving the cutter head. These, with lighting, constitute all of the a.c. load. Since direct current was necessary for exciting the synchronous motors, it was decided to install a motor-generator set large enough (100 kw.) so that the control advantages of d.c. could be utilized in certain auxiliary drives. Most important of these is the 65-hp., 230-volt motor for swinging and hoisting the dredge intake and for lifting the spuds when the dredge is to be moved. The two 40-hp. pumps that supply water for priming and gland sealing water on the main pump and for general service are also on the d.c. circuit. Except for those on the water pumps, which came from the Electro-Dynamic Company, all of these drives were furnished by the Elliott Company. For standby service a 35-kw., d.c. Buda-Diesel unit is installed.

Energy for the dredge is supplied by the Commonwealth Edison Company by means of a 12-kv. line, 8 miles long, erected on the river bank. The substation for stepping the line voltage down to 4,000 is mounted on a steel barge which will be moved and tapped into the line at various points as the dredge progresses. Connection between the dredge and substation is by a 1,200 ft. length, four-conductor cable (three phases and neutral) covered and insulated wholly with rubber. This is a General Electric cable. It terminates on the dredge on a large reel from which the energy is taken off through slip rings.

•

Multi-Speed Drive for Envelope Machine

In modernizing its factory the Boston Envelope Company, Dedham, Mass., refitted many machines with new motor drives to save space, improve departmental interiors and increase operating flexibility. The universal rotary machine shown herewith folds open-end envelopes and was formerly driven by a direct-current motor through a countershaft occupying valuable space at the left of the unit. The new layout substitutes a 2-hp., variable-speed, United States motor bolted to the floor that provides adjustment between 590 and 295 revolutions per minute by hand-wheel control. A short screened-in belt drives the machine main shaft. The motor, starting box and wiring conduit are at one side of the production line. The machine will turn out 5,000 envelopes per hour. Speed can be adjusted to the requirements of the stock without loss of time to the operator. This feature is proving of increasing value in enabling individually driven units to be kept up to "concert pitch" in production as internal plant conditions vary.



Motor drive is fully accessible and outside the main production line

Are You

"KIDNAPPED KURRENT KONSCIOUS"?

One polyphase current "snatch" case may exceed in lost revenue, a flock of single phase cases.

You know that Superior single phase meter enclosures DO DISCOURAGE diversion and have proven their worth.

Superior Polyphase meter enclosures will do it too. Sure we'll send Bulletin 344.

Our Business is to help you get paid for ALL energy consumed.

Superior Switchboard & Devices Co.
Canton, Ohio

*Been at it Since 1920

SUPERIOR
REG. U. S. PAT. OFF.

Draft Tube Design Improved by Model Studies

[*Continued from page 51*]

stalled into the set-up instead of the draft tube and the actual friction encountered within the testing apparatus was determined. These friction readings were taken in the same manner as if the draft tube had been in place, assuming the rectangular box had no loss of head due to friction. In order more easily to compare the results the quantities for the various runs were adjusted to the same basic quantities, also compensation was made for the other readings so that they would agree with the basic quantities.

C_1 remains constant regardless as to what tube was being tested, therefore instead of computing efficiencies the value of C_2 was used as a means for comparing the various tubes; the higher the value the more efficient the tube. For all the tests made, check readings were taken and care was used in maintaining the exact conditions under which the testing was conducted so that the reliability of the results could be assured.

Conclusions of draft tube tests

Construction of the power house substructure was proceeding very rapidly during our testing program, which compelled a decision on the draft tubes before improved designs could be completed and tested. By observing the flow in the transparent models it was possible to decide where possible alterations should be made. The model draft tubes could be removed from the testing flume and submerged in boiling water to make any change that seemed necessary.

By using the transparent models and studying the flow by means of the slow-motion pictures draft tube designs could no doubt be advanced to the ultimate efficiency possible. However, the first tests that were made on the fan jet principle convinced us that it would take considerable experimenting with costly models to make a practical application of the theory. The splitter type of draft tube also has many possibilities and the visual methods should aid in the design.

The centrifugal balancing principle has great possibilities for Kaplan turbines. The exit discharge from this tube is much different from the ordinary draft tube, in the fact that there is practically no disturbance in the tailrace, which indicates a small loss in the form of residual velocity head.

It is the opinion of the author that the scroll and draft tube testing should be made with an actual turbine model, as it is impossible to simulate the discharge from the runner and the whirling action produced by the distributor vanes and control gates.

New ENGINEERING IDEAS

Discoveries, proposals and developments by electrical engineers and scientists in the field, the factory and the laboratory

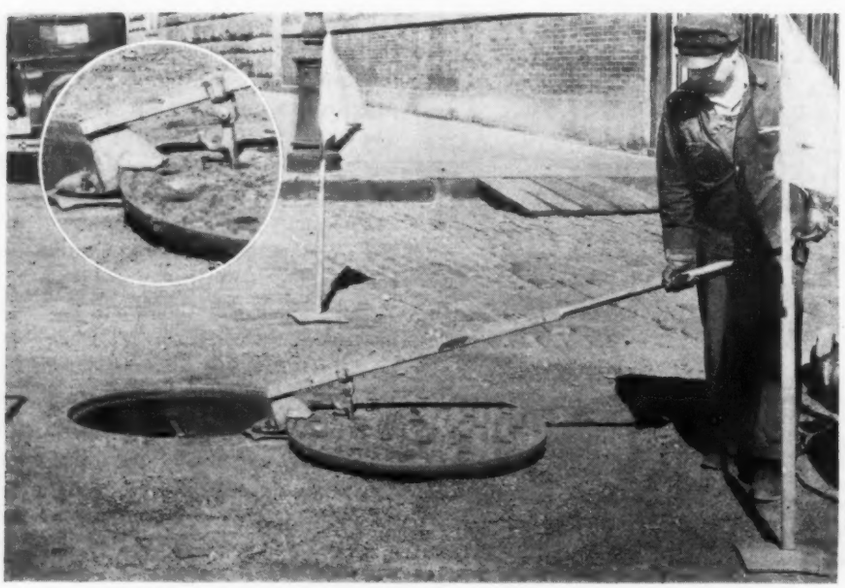
Manhole Lifter Reduces Hazards

A new device to make the operation of removing and placing heavy metal manhole covers as fool-proof as possible has been developed by engineers of the New York Edison Company and is now in general use in the distribution department.

The new lifter is made to be used on both round and rectangular manhole covers of the ventilated type. It consists of a telescopic arm of metal tubing welded to a foot piece made of two pieces of boiler plate bolted and pressed so as to permit the arm to swivel and afford ample gripping surface on the pavement. To this handle a two-purpose hooking device is fastened; the long hook is used on the round covers and the short one for the adapter saddle used on the rectangular covers.

To operate the lifter the foot piece is placed beside the manhole and the hook inserted in a hole in the manhole cover which will place the handle of the lifter directly opposite the place where the cover is to be deposited. The operator then walks around the manhole, lifting the cover by raising the handle and pivoting the weight of the cover on the foot piece.

The length of the arm is such as to keep the operator's feet at a safe distance from the cover, thereby greatly reducing danger of foot injury, back strain and hernia.



Manhole lifter easily operated by one man. Detail of lifter foot and hook shown in insert

Shielded Reactor for Fault Bus Protection

Where fault bus protection is to be used in large generating stations it is desirable to surround the electrical equipment with metal inclosures. Around buses, switches, instrument transformers and the like this is a comparatively simple matter. However, the large stray fluxes surrounding current-limiting reactors induce secondary currents in any nearby metal objects that add to the complexity of any scheme for inclosing reactors. Secondary currents in such shields increase the total reactor losses and cause considerable heating in the shield. During abnormal disturbances enormous mechanical forces are created between the reactor and shield which tend to burst the shield.

By breaking up or isolating any of the secondary circuits that may be formed by the stray magnetic fluxes and with proper insulations interrupting the paths of any of the secondary currents that might be detrimental to the shield or reactor the Metropolitan Device Corporation, New York City, has attained a reactor shield design from which mechanical forces are said to be entirely eliminated. The Murray shield, as it is called, is of sheet aluminum made in the form of a cubicle closed at top and bottom. According to the shield size the thickness of the aluminum varies from 3/32 to 3/16 in. Vertical sides are made in sixteen sections, while top and bottom are in eight sections each. All sections are insulated from each other by 1/16-in. micarta and are clamped by Everdur bolts which are insulated from

PER POLE YEAR

WESTERN RED CEDAR POLES

ighted utilities, seeking low cost power line construction and maintenance, find the wer in Western Red Cedar poles.

rength: The strength properties of Western Red Cedar poles are well established. for size they possess ample reserve strength beyond normal requirements to insure efficient and trouble-free service.

urability: Cedar poles are naturally resistant to decay and insects because of the ilt toxicity of the heartwood. Butt treatment of the sapwood only is necessary.

tability: Cedar's natural taper, large butts and butt treatment, mean a low center of vity. This insures greater ability to stay in alignment when exposed to winds, sleet, other transverse forces. This saves straightening and guying costs.

daptability: Attachment of cross arms and ckets, fastening of braces and guys, instal- on of transformers, switches and other ratus after erection can be done at any and without endangering the life of pole.

leanliness: The clean surface and uniform ure of cedar poles make them easy to dle and to climb.

nsulation: Low conductivity of cedar ces lightning outages and enables linemen do "hot-line" work quickly and with ater safety.

Western Red Cedar poles, although higher rst cost, have truly earned their popularity use their use results in "Lowest Cost Per e Year".

The Large Heartwood of Western Red Cedar is preserved by Nature with a Toxic Substance more Potent than found in commonly used commercial preservatives

NOTE THESE EXCLUSIVE QUALITY FEATURES OF

WESTERN RED CEDAR—

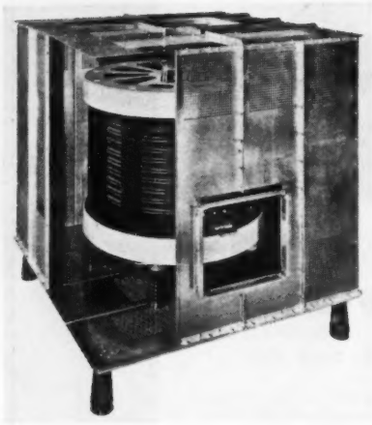
- **Western Red Cedar Poles are straight, strong, rigid, yet light in weight.**
- **Their large heartwood, preserved by nature, is highly resistant to decay and insect damage.**
- **Western Red Cedar combines, in one wood, more basic power line pole properties than found in any other pole timber.**
- **The natural preservative of Cedar is permanent . . cannot be varied, and is constant and effective from the top to the bottom of the pole.**
- **Additional gains can be added and holes drilled anytime after erection for joint use or for installation of additional equipment without endangering the life of the pole.**

WESTERN RED AND NORTHERN WHITE CEDAR ASSOCIATION

Metropolitan Bank Building MINNEAPOLIS, MINNESOTA

CEDAR POLES

Construction and Maintenance



Reactor shield design avoids heating from secondary induced currents through use of insulated shield sections

the shield. Everdur lock washers prevent loosening of the bolts. Half-inch holes perforated through the shell at top and bottom insure adequate ventilation through the reactor as well as the shield.

To connect the shield as a unit to the fault bus separate sections of the shield are short circuited at alternate opposite points at places of minimum flux flow. Short circuiting is such that the shield forms two distinct electrical circuits around the reactor. The shield is insulated from the ground as well as from the reactor to restrict the eventual fault current flow from the shield into the fault bus only. Arrangement of these two sets of insulators is such that the entire reactor and shield weight is transmitted directly upon the supporting floor without any static load on the shield.

Near the bottom of two opposite sides of the shell suitably located manholes permit access to shield interior for inspection and cleaning the reactor. Properly located openings in the shield provide means of passing external circuit leads to the reactor.

•

New English Clamp for Rural Lines

On the 33,000-volt lines of the mid-Lincolnshire rural development in England cadmium-copper conductors are used with suspension insulators and spans are 520 ft. Tension clamps presented difficulties that were solved by a new arrangement. The three wires of the conductor, untwisted and side by side, are passed over a thimble; then, after twisting the ends into the interstices of the main cable, three single-bolted clamps are attached at 4-in. intervals. At 8 in. from the first clamp the wire is cut and the end bound in with No. 14 soft copper wire. The second and third wires are carried out 8 in. and 16 in. further and treated in the same manner. It is claimed a dampening effect is gained as well as a strong construction.

•

A Reinforced Design for Concrete Poles

Reinforced concrete poles in 24- and 30-ft. lengths are being manufactured and used with considerable success by the Hamilton (Ontario) Hydro-Electric Power Commission. These poles, used on distribution lines, are octagonal in shape, 6 in. between faces at the top, and have a taper of 1 in. in 5 ft.

A working load of 500 lb. applied 1 ft. from the top was used as the basis of design. A steel-reinforcing cage calculated to take all the bending moments at any section is used. This cage for a 30-ft. pole consists of four rods 29 ft. 6 in. x ½ in., four rods 24 ft. 6 in. x 7/16 in., four rods 17 ft. 9 in. x 7/16 in. and four rods 12 ft. 9 in. x 7/16 in., all welded to six steel spacing rings ¼ in. in diameter. The effective area of the steel at the ground line is 1¼ sq.in. and its weight is 192¼ lb. A comprehensive stress of 1,000 lb. for concrete and 18,000 lb. for steel was used. Minimum coverage of 1¼ in. was allowed for reinforcing.

Hinged forms were used. Each side of the form makes three faces of the pole and is made in one piece hinged at the bottom to a light channel section base. The eighth face is open and is finished by troweling. Holes for the bracket bolts are formed with tapered pins. A special fixture which also acts as a speader for the side forms is used to position the reinforcing cage. An electric vibrator attached to the form consolidates the concrete as it is poured into the form.

A 1-2-3 mix with moist sand and ½ to ⅜ in. crushed rock is used. Fifty pounds of water per 87½ lb. bag of cement is supplied in mixing.

Tests results to date on the 30-ft. poles have shown an average deflection of 4¼ in. for the basic load of 500 lb. applied 1 ft. from the top of the pole. An ultimate load of 1,600 lb. produces an average deflection of 21½ in. It is believed that there is little danger of straining the pole beyond its limit since a 500-lb. load produces a moment of 12,000 ft.-lb. at the ground line and the soil would probably give before this value was reached, according to A. W. Bradt, chief engineer, and W. H. Weller, consulting engineer, in an article in a recent issue of *The Bulletin* of the Hydro-Electric Power Commission of Ontario.

EDGE-WOUND RESISTORS CONSERVE SWITCHBOARD SPACE

Where equipment for a control board includes a large number of resistors, accessibility may be increased and a greater percentage of the room back of the board utilized for other purposes by the use of edge-wound resistors. This storage battery control board, built by the Westinghouse Electric & Manufacturing Company for a large Pacific Coast storage battery company, is an excellent example of the advantages gained from the use of edge-wound resistors

DON'T FORGET

THE *Man* WHO PUTS THEM UP

Specify
L-M DISTRIBUTION TRANSFORMERS

Easy to install . . . easy to inspect . . . easy to service . . . safe to work with . . . the L-M Distribution Transformer is truly a "lineman's transformer". And by reducing installation time, L-M design effects operating economies important to the construction department.

To both lineman and engineer L-M details are practical. One size hanger for all sizes of L-M Transformers. Solderless connectors. Easy-to-read stainless steel nameplates. Husky lifting lugs for easy hoisting. Write to Line Material Co., South Milwaukee, Wis., for Transformer information.

LINE MATERIAL CO.

Building Up THE LOAD

New ideas and practices in selling electrical equipment and service to industrial, commercial and domestic customers

Newburgh Skates on Illuminated Track

By WALTER H. DOYLE
Lighting Engineer,
Central Hudson Gas & Electric Company,
Poughkeepsie, N. Y.

Civic authorities in Newburgh, N. Y., believe in providing the 33,000 residents with a year-round program of varied sports and entertainment under the direction of a Recreation Commission. Last winter they offered something new in the form of an ice skating track lluminated every night with a permanent, carefully planned lighting installation.

Working with civic authorities, our lighting representatives, during the summer of 1935, prepared specifications for a permanent installation to illuminate the sixth of a mile track, which had previously been lighted with a makeshift arrangement of two floodlights. This rink, measuring 800 ft. around and 40 ft. wide, with retaining walls of concrete, is in the shape of an oval track. A track of this design is better for long-distance skating and requires less upkeep for the distance furnished.

The lighting installation was designed to focus the maximum amount of illumination on the 40-ft. wide track without wasting it on the area outside, to give a good distribution over the entire course, to eliminate, as far as possible, the formation of shadows on the ice from the skaters as they spin along, and to prevent the light sources from shining into the skaters' eyes.

Each night of skating weather the track was lighted until 10 o'clock. Throughout the season there was a total attendance at this rink of 55,375 skaters and 15,585 spectators.

Future plans of the Newburgh Recreation Commission include improvements for the track—first, an asphalt foundation instead of the present dirt foundation, which will make it possible to flood the rink earlier and later in the season, and to use it also for roller skating and dancing in warmer weather. Another plan for the future, when funds permit, is to construct a hockey field on the oval area within the confines of the rink. The lighting specifications were designed with this in view, so that floodlights mounted on the other side of the present standards can furnish the right type of illumination for the proposed hockey field.

Lighted skating oval available for community recreations

On the inside of the track eighteen Union Metal standards, 24 ft. high, are spaced 50 ft. apart, and at a height of 22 ft. porcelain enamel elliptical angle reflectors are mounted, with a 300-watt inside frosted lamp in each unit. There are four circuits, controlled by switches inside the Recreation Commission office building at the park, while a switch on each pole also allows the lights to be turned on and off individually.

•

"Free" Electricity Features Rentals

What could be a better commentary upon the inexpensiveness of household electric service than the novel display board of a realtor advertising modernized apartments on Audubon Road, Boston? Twenty apartments will be served by the Boston Edison Company through a master meter from which the usage of the group will be billed by the utility without submeter-

FLASH

L&H RANGES
NOW EQUIPPED WITH
NEW *HI-SPEED L&H Calrod*

This *is* NEWS! It means soaring sales for every L&H Range dealer . . . now that L&H Electric Ranges have the new, improved *Hi-Speed L&H Calrod* — in addition to all the other L&H exclusive, sales-pulling features.

Radically new in design . . . but drastically tested *and proved*. . . the *Hi-Speed L&H Calrod* is a remarkable heating element that makes electric cookery amazingly speedy and economical.

The *Hi-Speed L&H Calrod* wastes no heat. Utensils rest directly upon its glowing spiral . . . with no heat-absorbing space or material between. Cooking begins immediately . . . takes less time . . . consumes less current.

With its resistance wire hermetically sealed and insulated in an enduring metal sheath. . . *Calrod* is not only safer but almost everlasting. Protected against harm by foods boiling over. . . immune from deterioration by air or moisture . . . it will not only withstand rough usage but take more abuse than it could possibly receive in a lifetime of normal household use.

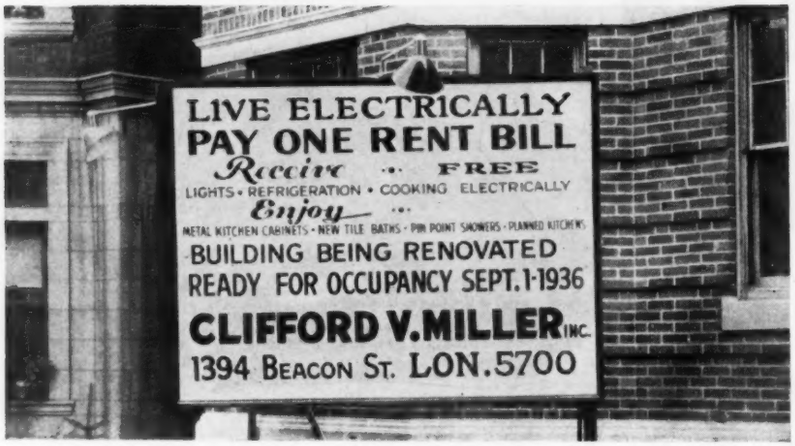
8500B-1—SILVER PEARL
L&H ELECTRIC RANGE
WITH OR WITHOUT NO. 8 HANDY COOKER

Two appliance outlets—one time-controlled, one regular. Warming drawer unit controlled by toggle switch. Adjustable shelf in cabinet. Round cornered electrically welded oven. Time-a-Ture consists of Synchronous self-starting clock, Automatic timecontrol, Temperature control, Time selector switch, two appliance outlets, lamp receptacle, pilot light, all in one unit assembly.

WRITE OR WIRE FOR COMPLETE DETAILS

A. J. LINDEMANN & HOVERSON CO.
MILWAUKEE • WISCONSIN
NEW YORK CHICAGO SAN FRANCISCO

L&H ELECTRIC RANGES


LIVE ELECTRICALLY
PAY ONE RENT BILL
Receive FREE
LIGHTS • REFRIGERATION • COOKING ELECTRICALLY
Enjoy
METAL KITCHEN CABINETS • NEW TILE BATHS • PIN POINT SHOWERS • PLANNED KITCHENS
BUILDING BEING RENOVATED
READY FOR OCCUPANCY SEPT. 1-1936
CLIFFORD V. MILLER INC.
1394 BEACON ST. LON. 5700

Master meter, no submetering, energy use goes with rooms

ing. Rentals will cover lighting, refrigeration, electric cooking and other uses at an estimated cost to the landlord of not more than $5 or $6 per month per apartment. Prices for suites range from $35 to $65 per month, according to the number of rooms and location, and the suites vary from one to three rooms. General Electric ranges and Kelvinator refrigerators have been purchased by the building owner, and preliminary inquiries led the owner to remark that if he had three times as many suites he would be able to rent them with little delay, judging from the interest of the public. A number of other apartment buildings in Boston will soon join the ranks of those providing service on the above plan.

Tasty Toothpicks by Electric Heat

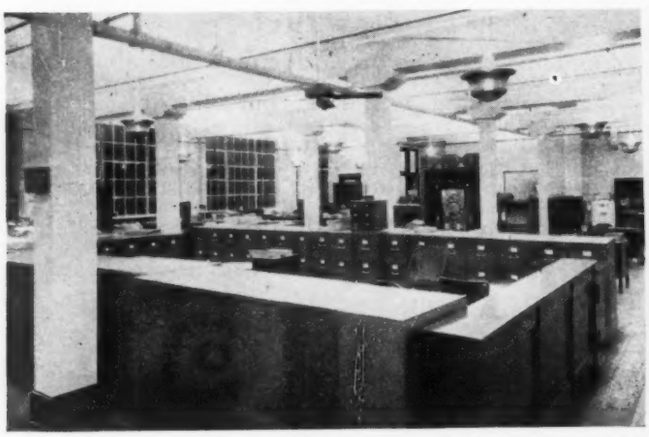
By H. R. STEVENSON
Detroit Edison Company, Detroit, Mich.

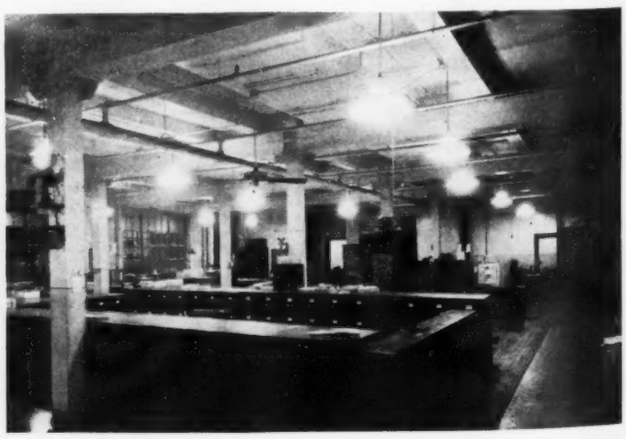
Success in building up midget heater load in industrial plants does not derive so much from ability to sell the units themselves as from the rarer faculty of perceiving how and where the special advantages of electric heat can be utilized. Here is the case of the Stim-U-Dent Company, maker of toothpicks extraordinary.

The Stim-U-Dent toothpick is about the usual length of such tools, but is of unvarying square section for most of its length, pointed at only one end, instead of tapering or flattening to both ends like most dental excavators. But the principal distinguishing feature of the Stim-U-Dent is a slot running the whole length of the stick and which is loaded with a germicidal and decay-arresting compound pleasant to the taste. The idea is that the pick, compressed as it is forced between the teeth, will thus deposit the antiseptic compound in the places where it is most needed and which are also the most difficult to reach by ordinary means. A final step in the production of these toothpicks is baking for the purpose of drying the compound in the slot.

This baking was done at first in a combustion-heated oven. It would still be done that way if the power salesman who looked at it had not wondered if maybe the toothpicks would not taste better if they were baked in an electric oven. So a batch-type, low-temperature oven about 5 ft. long, 3 ft. wide and 2 ft. high was built and tried out with a 2-kw. heater element. It worked very nicely and is still working. Now, it is a matter of argument whether or not the electrically baked toothpicks taste any better than the fire-baked ones. But there can be no argument about the facts that a fire risk has been eliminated, that better heat control has resulted in a more uniform product and that working conditions around and near the oven are much improved.

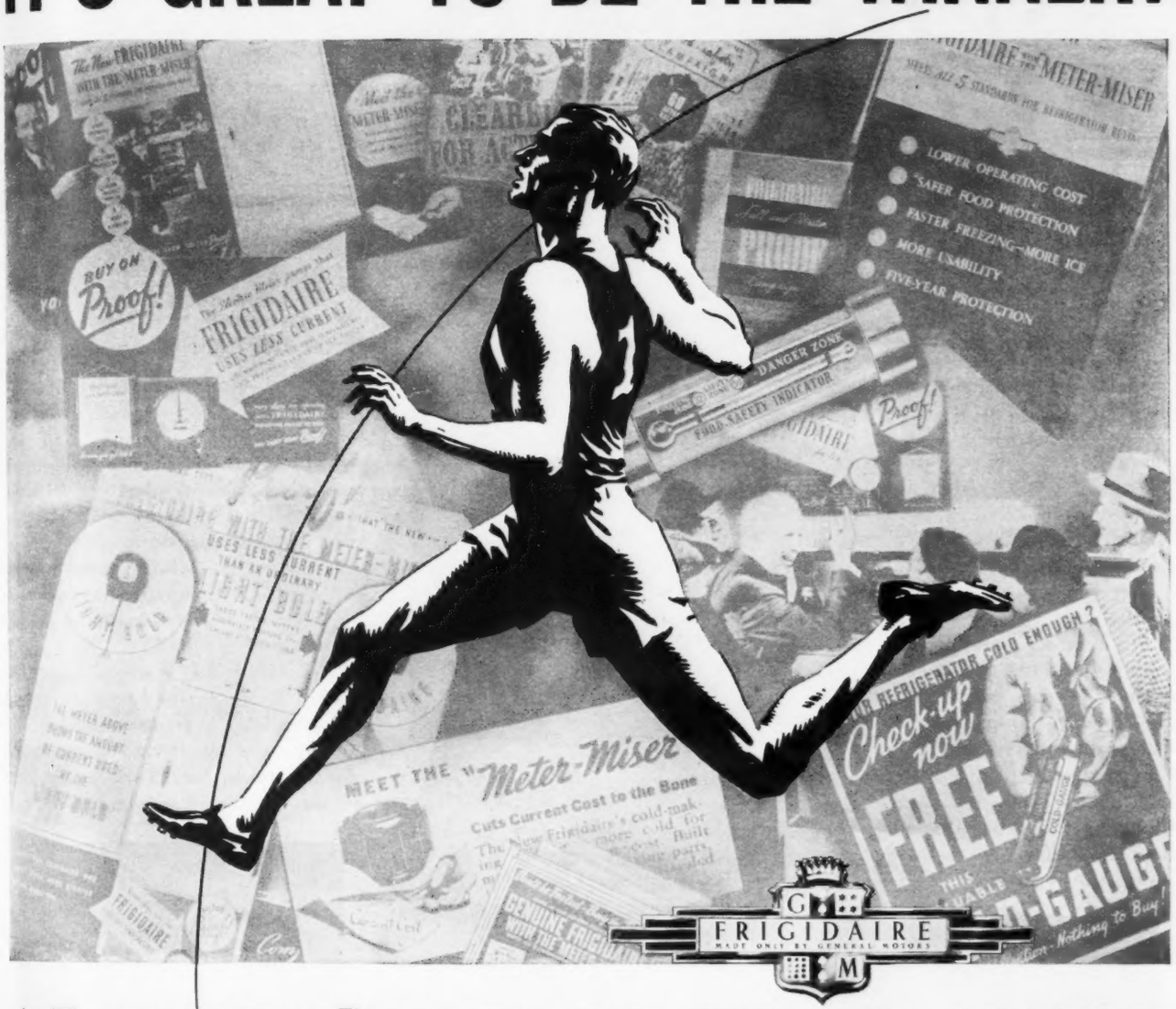
Better Work in Better Light





Direct lighting has its place, but its place is not in a modern office where quick visual perception is a prerequisite to easy, accurate work. This point became abundantly clear to the Signode Steel Strapping Company, Chicago, after it had acted upon recommendations made by lighting engineers of the Commonwealth Edison Company. Previously the office had been lighted by Glassteel diffusers spaced on 16-ft. centers and using 200-watt lamps. The illumination was inadequate and very uneven. Intensity ranged from 2 to 8 ft.-candles and everywhere the eye met the harsh shadows and glare characteristic of direct lighting. The ceiling of the room was refinished and Curtis 750-watt wholly indirect fixtures were installed. As the picture at the left shows, the result is an even, glareless illustration, sufficient for eye comfort anywhere in the room

IT'S GREAT TO BE THE WINNER!



★ FRIGIDAIRE DEALERS WIN WITH THE GREATEST REFRIGERATOR SELLING CAMPAIGN IN HISTORY!

No wonder Frigidaire dealers are winners! The Spring "Proof" Campaign sold more Frigidaires than had ever been sold in any previous year! The Midsummer Cold-Gauge Campaign sent more than 2 million people to Frigidaire dealers' showrooms! And the Fall and Winter Campaign, now in progress, is another winner! The "Meter-Miser"—Frigidaire's *exclusive* cold-making mechanism—has been the year's sales sensation. *Proof* that Frigidaire meets *All* 5 standards for refrigerator buying has influenced hundreds of thousands to buy. Powerful advertising! Superior product! More effective dealer helps! Greater public acceptance! These are the reasons why Frigidaire dealers, adding their efforts to ours, are making more refrigerator profits than ever before!

FRIGIDAIRE CORPORATION, DAYTON, OHIO

YOU WILL DO *still Better* WITH FRIGIDAIRE . . . IN '37!

News ABOUT PEOPLE

Niagara Hudson Elects New Vice-Presidents

Election by the board of directors of Francis J. Brett of New Rochelle, N. Y., and of John L. Haley of Albany, N. Y., as vice-presidents of Niagara Hudson Power Corporation was announced last week by Alfred H. Schoellkopf, president of the corporation. Mr. Brett continues as controller, an office he has held since 1930.

Mr. Brett's connection with the corporation and its subsidiary companies extends over a period of 28 years. He worked through various departments of the Niagara Falls Power Company and, in 1917, became general auditor of the Tonawanda Power Company. Shortly after the formation of Buffalo, Niagara & Eastern Power Corporation in 1925 Mr. Brett

F. J. Brett

became its assistant treasurer and later its treasurer. When, in 1929, Niagara Hudson Power Corporation was formed as the parent company, he became its assistant treasurer.

In addition to being vice-president and controller of Niagara Hudson Power, Mr. Brett is now a director of

J. L. Haley

the Central Hudson Gas & Electric Corporation. A member of the Controllers Institute of America, Inc., he was appointed chairman of the Institute's committee on the Public Utility Act of 1935. He is also a member of the Edison Electric Institute, the American Gas Association and the accounting committee of the Empire State Gas and Electric Association.

Mr. Haley has been connected with the gas and electric industry since 1914 and his service with the Niagara Hudson System companies and their predecessors began in 1922 as commercial manager of Adirondack Power & Light Corporation. He has been a vice-president of New York Power & Light Corporation since its organization in 1927 and a director since 1935.

•

▶ FRED M. DAVISON has been elected to head the refrigeration division of the Cincinnati Electrical Association for the ensuing year. Mr. Davison is manager of the Cincinnati district for the Frigidaire Corporation. He succeeds Carl E. Haller of the Graybar Electric Company.

Westinghouse Elects Bucher Executive Vice-President

At a meeting of the board of directors of the Westinghouse Electric & Manufacturing Company held last week, George H. Bucher was elected executive vice-president with headquarters in Pittsburgh. Mr. Bucher, who is also president and general manager of the Westinghouse Electric International Company, has been connected with the Westinghouse organization since 1909.

He joined the Westinghouse Electric & Manufacturing Company at East Pittsburgh as a graduate student. In 1911 he was transferred to the export department in New York and in 1920 he was appointed assistant to the general manager of the Westinghouse Electric International Company. Subsequently he served as assistant general manager, vice-president and general manager and since 1934 as president and general manager. In 1935 he was elected vice-president of Westinghouse Electric & Manufacturing Company. Mr. Bucher is a member of the American Institute of Electrical Engineers.

G. H. Bucher

Burroughs

BURROUGHS TYPEWRITER ACCOUNTING MACHINE

Writes check (or pay envelope), earnings record, employee's statement and payroll summary in one operation. Column selection automatically controlled. All totals accumulated. This machine is only one of several models; payroll work is only one of the many jobs they do.

SIMPLIFIES PAYROLL ACCOUNTING

and gives you the additional information required by the

SOCIAL SECURITY ACT

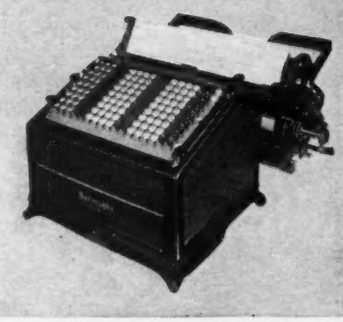
BURROUGHS DESK BOOKKEEPING MACHINE

Posts earnings records, automatically prints dates in proper columns, automatically subtracts deductions—calculates net pay. Can also be used as a fast, practical adding-subtracting machine for all kinds of accounting work. Many styles and many models—all low in price.

BURROUGHS CHECK-WRITING TYPEWRITER

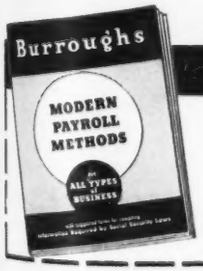
Writes payroll checks in units or in strips. Payroll summary completed in same operation. Fast and easy insertion and removal of checks. Can also be used as a typewriter for correspondence and general typing. Electric carriage operation. Several models.

BURROUGHS offers many new and improved machines which not only supply the additional payroll information required by the Social Security Act, but also handle the entire payroll job with exceptional speed, ease and economy. It will pay you to investigate these new machines. Telephone the local Burroughs office, or send for the new payroll folder described in the coupon below.



BURROUGHS AUTOMATIC PAYROLL MACHINE

Writes check (or pay envelope), employee's earnings statement, earnings record and payroll summary in one operation. Accumulates all necessary totals, automatically ejects and stacks checks in order. Many models for payroll work, as well as for scores of other accounting jobs.



SEND FOR THIS NEW PAYROLL FOLDER!

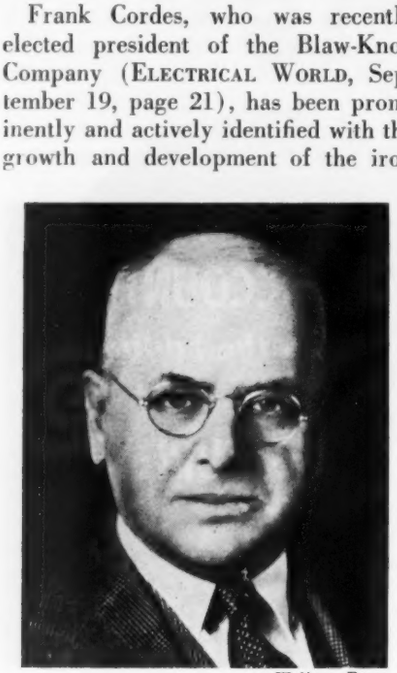
BURROUGHS ADDING MACHINE COMPANY, 6930 SECOND BLVD., DETROIT, MICH.

Send me the new folder "Modern Payroll Methods," illustrating complete payroll accounting methods, with typical forms for maintaining the information required by the Social Security Act. The forms show representative entries and suitable column headings.

Name_____ Address_____

Cordes Head of Blaw-Knox; C. H. Lehman Vice-President

Frank Cordes, who was recently elected president of the Blaw-Knox Company (ELECTRICAL WORLD, September 19, page 21), has been prominently and actively identified with the growth and development of the iron



Writers Press

Frank Cordes

and steel industry for more than forty years.

He obtained his early experience with the Edgar Thompson Works, Carnegie Steel Company, Braddock, Pa., and with the Lincoln Foundry Company. Subsequently he became president of the Best Manufacturing Company of Pittsburgh, and later of the Hubbard Steel Foundry Company, East Chicago, Ind. Some few years later Mr. Cordes was appointed manager for one of the plants of the Wheeling Mold & Foundry Company, where he remained for five years. He then bought the Lewis Foundry & Machine Company, becoming its president. The company merged with the Blaw-Knox Company in 1929, when Mr. Cordes was elected vice-president of that company, still retaining the presidency of his own company. In the future Mr. Cordes will devote his time exclusively to the duties of his new office.

C. H. Lehman

Chester Hamilton Lehman, recently elected senior vice-president of Blaw-Knox, is a graduate of Harvard University and has been with the company during his entire business life. He has been successively purchasing agent, advertising manager, secretary, general sales manager before attaining his present position as senior vice-president. Mr. Lehman is a director of the Blaw-Knox Company and subsidiary corporations.

•

▶ RAYMOND C. SCHNEIDER, secretary of the Connecticut Public Utilities Commission, has recently completed 25 years of continuous service for the state. Mr. Schneider was first employed by the commission as recording stenographer and assistant secretary in 1911. In 1930 he was appointed secretary.

▶ DR. AUGUSTIN FRIGON, well-known Montreal engineer, and at the present time chairman of the Quebec Electricity Commission appointed by the last provincial government of Quebec, has been appointed assistant general manager of the recently created Canadian Broadcasting Corporation. Until recently Dr. Frigon was principal of l'Ecole Polytechnique, Montreal.

▶ S. J. GARAHAN has been appointed manager of sales for the cable section of the General Electric Company's central station department, according to an announcement by F. H. Winkley, manager of the lighting and cable section. He is succeeding R. G. Bellezza, who has become associated with the Locke Insulator Corporaton as vice-president and manager of sales. Mr. Garahan entered the General Electric Company service in 1904 as an employee in the shipping department of the Schenectady Works. In 1909 he was transferred to the wire and cable department, becoming assistant to the head of the cable division in 1923. He was placed in charge of cable quotations in 1929 and later was appointed assistant manager of cable sales.

D. B. Leonard of Portland Receives Promotion

D. B. Leonard, formerly agricultural agent for Pacific Power & Light Company, Portland, Ore., has been appointed commercial manager of the company. This is a position created recently to co-ordinate all load building activities in the commercial, domestic and rural departments of the business. Guy E. Davis, formerly merchandise manager, will be in charge of domestic sales as domestic sales supervisor.

Mr. Leonard joined the Pacific Power & Light Company organization

D. B. Leonard

in 1929, after seven years of extensive and varied experience in agricultural development work. He is a graduate of Washington State College.

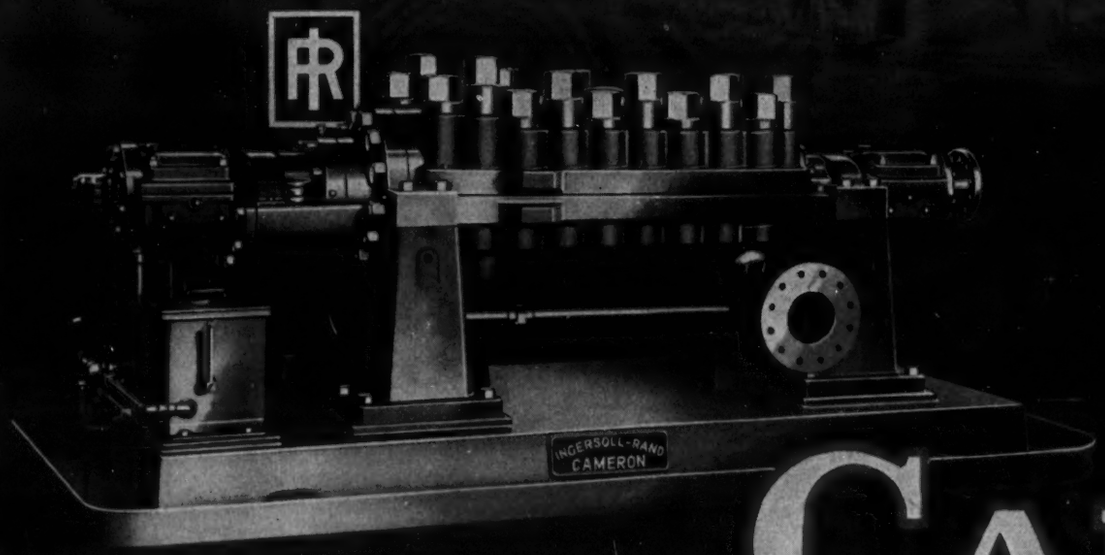
•

▶ FRANK GOODELL, chairman of the board and head of the marketing division of Anderson, Davis & Platte, Inc., advertising agency, will retire from that firm to become vice-president in charge of sales of the Birdseye Electric Company, manufacturer of reflector lamps. Mr. Goodell's career has been entirely identified with marketing, both as a director of sales and as counsel to a number of important corporations.

▶ NORMAN V. ARNTZEN has been appointed sales engineer, northwestern district, according to an announcement by W. W. Glosser, vice-president, Pacific Coast division of Hubbard & Company. Mr. Arntzen joined the organization in 1926 and since that time has served in various departments including service, production and sales. For the past six years he has been a

THE PHILADELPHIA ELECTRIC COMPANY

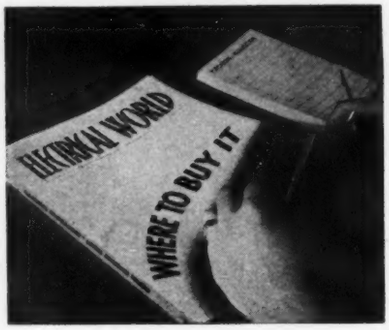
THE PHILADELPHIA ELECTRIC COMPANY..



● The record of Cameron Centrifugal Pumps serving high pressure boilers in the great Central Stations is unmatched for reliability and efficiency over a long period of years. Cameron design, quality of materials and high standard of workmanship have been proved by the test of service.

CAMERON

INGERSOLL-RAND • 11 BROADWAY • NEW YORK



The Key to Simplified Buying!

This handy reference volume, published annually by Electrical World, provides a simple guide that will save you time and money in your buying. Its classified directory of manufacturers provides an instant answer to the question, "Who Makes Clevises?"—or any electrical or allied products of nearly 3,500 manufacturers.

Likewise, the index of company and trade names, the products exhibit section, and the engineering tables—all are designed to simplify your purchasing.

Keep Electrical World's Buyers Reference Number handy—ready for immediate reference at any time.

ELECTRICAL WORLD
330 West 42nd St., New York, N. Y.

Now Available

on small monthly payments

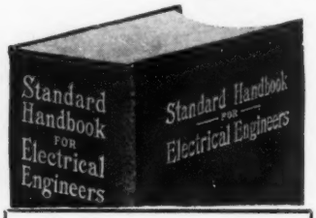
STANDARD HANDBOOK FOR ELECTRICAL ENGINEERS

Editor-in-Chief, Frank F. Fowle, Consulting Engineer—Assisted by 91 specialists

Sixth Edition — 2816 pages

NOW you can start using the Standard Handbook at once—paying in small monthly installments while you use it. No strings to the offer—no mark-up to pay installment charges—no difference in quality of the book. Just a special offer to urge action.

Tens of thousands of engineers get real benefits from the Standard. You will too. *On hand when you need it,* it will give security in troublesome situations, save dollars, hours and effort by giving the right, dependable answer at the right time. Take this easy step that may mean much to you later. Mail the coupon now.



28 helpful sections

Units and Conversion Factors
Electric and Magnetic Circuits
Measurements and Measuring Apparatus
Properties of Materials
Magnets, Induction Coils, Condensers and Resistors
Transformers, Regulators and Reactors
Alternating-current Generators and Motors
Direct-current Generators and Motors
Converters and Rectifiers
Steam, Gas and Oil Prime Movers
Hydraulic Prime Movers
Power-plant Electrical Equipment
Power Plant Economics
Power Transmission
Power Distribution
Wiring of Buildings and Industrial Plants
Illumination
Industrial Motor Applications
Electric Heating Applications
Electric Railways
Electric Trucks and Buses
Marine Power Applications
Electrochemistry and Electrometallurgy
Batteries
Wire Telephony and Telegraphy
Radio and Carrier Communication
Electron Tubes and Electric Wave Filters
Miscellaneous Electric Applications

McGRAW-HILL ON-APPROVAL COUPON

McGraw-Hill Book Co., Inc., 330 W. 42d St., N. Y. C.

Send Standard Handbook for Electrical Engineers for 10 days' examination on approval. In 10 days I will send $1.00, plus few cents postage, and $2.00 monthly for 3 months, or return the book postpaid. (Postage paid on orders accompanied by remittance of first installment.)

Signed .....
Address .....
City and State .....
Position .....
Company .....W. 10-10-36

member of the company's sales engineering staff, covering the territory of northern California and Nevada. In 1933 his field was extended to include Oregon and Washington. Mr. Arntzen will make his headquarters in Portland, Ore., confining his sales engineering work to Oregon and Washington only.

•

OBITUARY

F. H. Barrington

Frederick H. Barrington, vice-president and works manager of the Moloney Electric Company, died suddenly in Chicago September 17. Mr. Barrington had been associated with Moloney Electric Company for 25 years, having joined the Moloney Company of Canada in 1911. In 1914 he joined the Moloney Electric Company in St. Louis as chief electrical engineer. He will long be remembered for his fine service to the electrical industry and the many far reaching advances he introduced into modern transformer development. Mr. Barrington was born in Warterloo, Quebec, and was educated at McGill University. He received his degree in arts and science in 1901 and his engineering degree in 1906.

•

►C. L. OWEN, manager of the northern division of the Oklahoma Gas & Electric Company, died August 27, following a week's illness. Mr. Owen had been associated with the Oklahoma utility since 1920, when he entered the Muskogee office. Later he was sent to Sulphur as local manager and in 1925 became assistant manager in Enid, headquarters of the northern division. He had been manager of the division since 1928.

►LOUIS F. MUSIL, formerly treasurer of the Cities Service Company, died October 1 at the Columbia Presbyterian Medical Center, New York, of leukemia, after an illness of more than three years. He was 53 years of age. Mr. Musil was internationally known as an authority on industrial budgets. He entered the public utility field with the Laclede Gas Company and then became identified with the Springfield Gas & Electric Company. In 1905 he joined the Denver Gas & Electric Light Company and the following year when Henry L. Doherty & Company was

SHAKE HANDS *with a* REAL SNIP

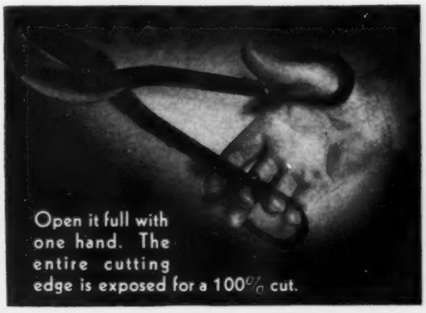
No. U-416
16" — $3.00

An ideal, heavy-duty snip for cutting tough metal. Popular in air conditioning work. Cuts curves as well as straight lines. Other models for every type of service.

TRY IT FOR "HANG"
TEST IT FOR BALANCE
COMPARE ITS FINISH

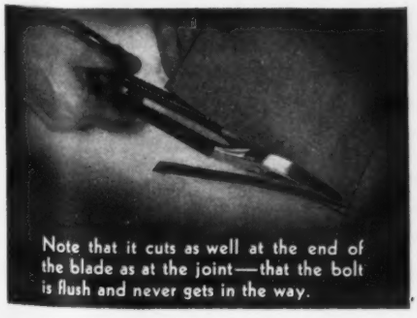
then put this CRESCENT SNIP *into Action!*

Notice the easy purchase that the large, comfortable eyes provide.

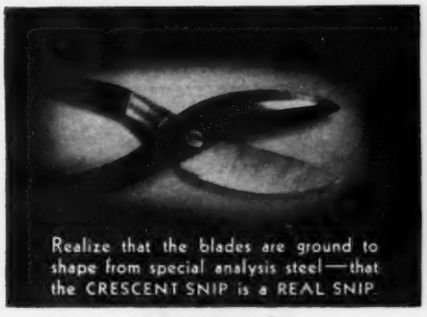


Open it full with one hand. The entire cutting edge is exposed for a 100% cut.

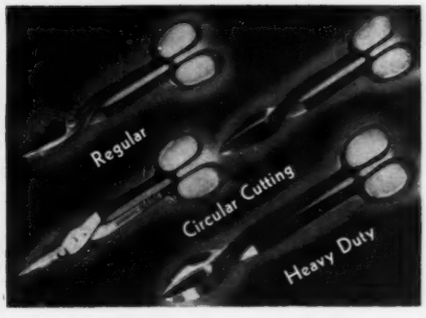
Close down on a tough piece of metal. It cuts cleanly, easily, from the start.



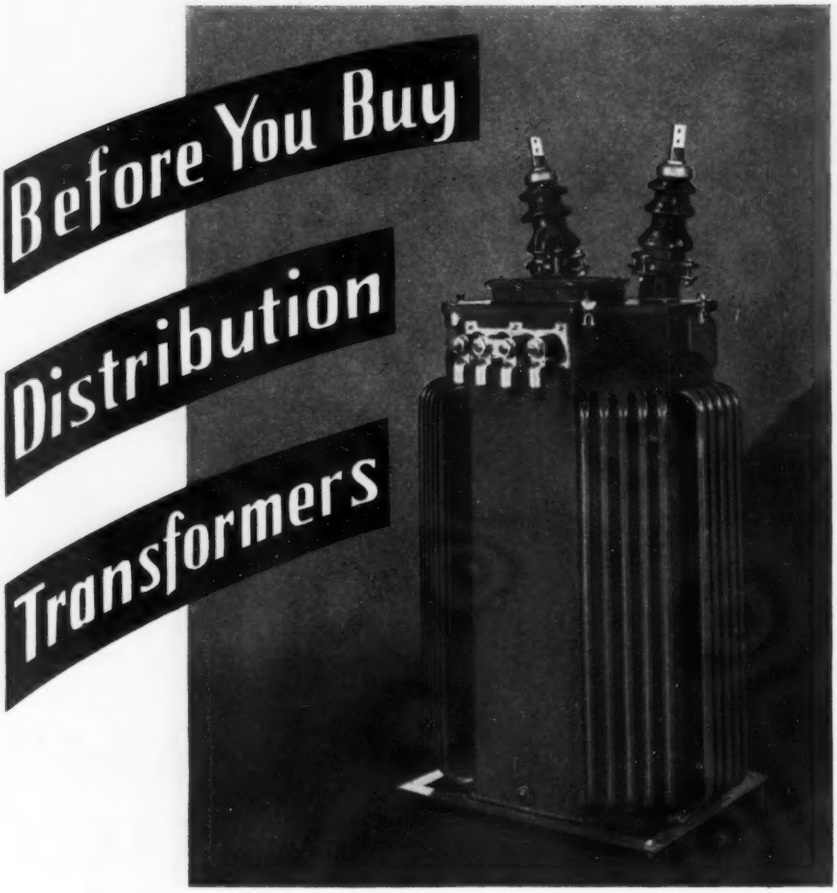
Note that it cuts as well at the end of the blade as at the joint—that the bolt is flush and never gets in the way.



Realize that the blades are ground to shape from special analysis steel—that the CRESCENT SNIP is a REAL SNIP.



CRESCENT and Smith & Hemenway TOOLS



Ask these questions..

1. Does the transformer have the features which provide the MAXIMUM in service, economy and safety?
2. Are the coils *circular,* so that they can withstand short circuits without distortion?
3. Are the coils of the OPEN type, similar to power transformers—instead of the ordinary closed type?
4. Are the coils treated in varnish which will not soften nor contaminate oil?
5. Do the coils have a low temperature gradient between copper and oil—a feature which permits greater overloads with perfect safety?
6. Is the temperature for coil treatment limited to 105° C, thus assuring a permanently safe and pliable insulation?
7. Are the high-tension and low-tension bushings bolted from the exterior of the case, eliminating the necessity for handling tools on inside?
8. Is the transformer insulation properly co-ordinated with the flash-over of the bushings, thus providing necessary surge-resisting qualities?
9. Is the transformer so designed that radio interference is reduced to a minimum?

PENNSYLVANIA

answers **"YES"**

Pennsylvania Transformers, incorporating these fundamental improvements, provide the maximum in service, economy and safety!

PENNSYLVANIA TRANSFORMERS

Pennsylvania Transformer Co.

1701 Island Ave., N. S. **Pittsburgh, Pa.**

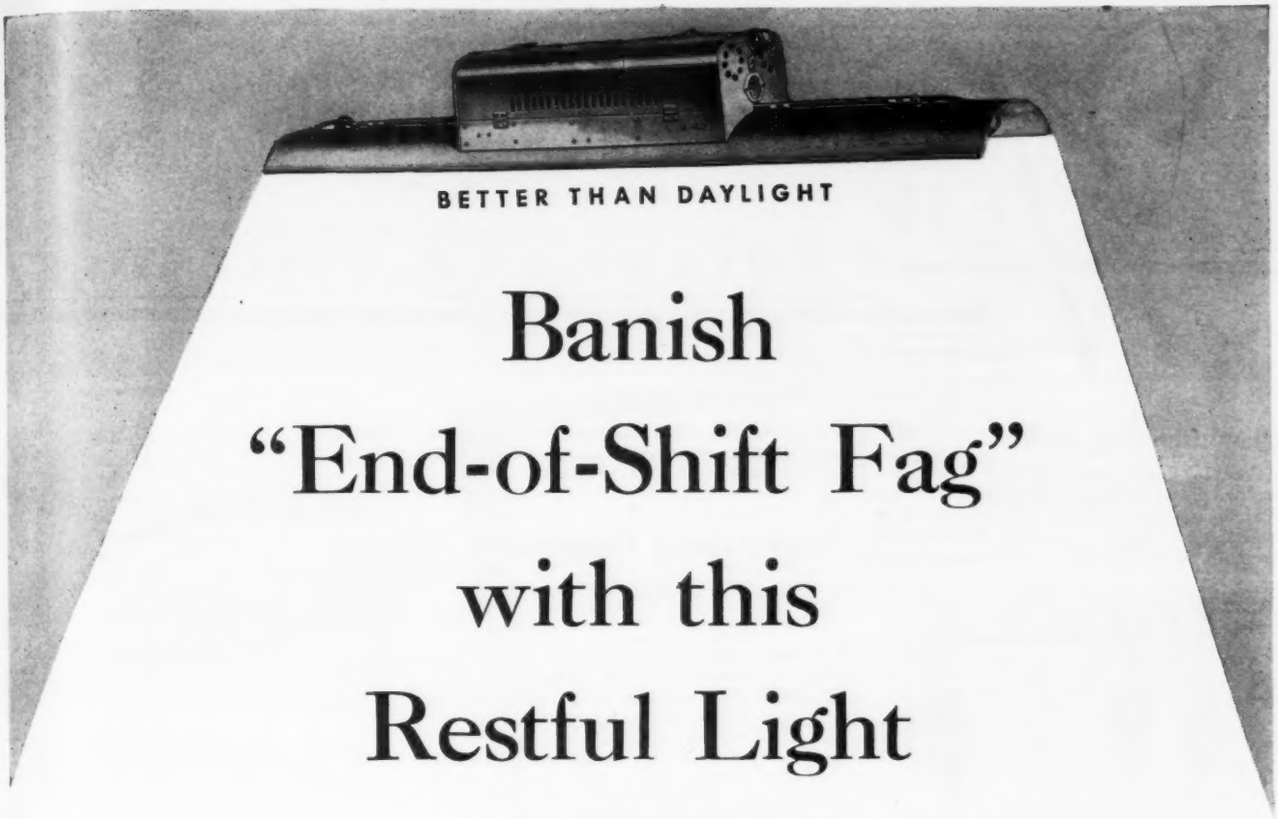
established in New York he became one of the staff. When the Cities Service Company was formed in 1910 Mr. Musil was made treasurer and director of finance. Later he became a director of the company and subsequently of many of its subsidiaries. He continued his connections with the Cities Service system until 1932, when illness forced him to resign. Mr. Musil was born in Manitowoc, Wis., and was graduated from the University of Wisconsin.

▶ ALBERT B. BAXTER, for 41 years a prominent electrical contractor at Providence, R. I., died in that city September 25, after a short illness.

▶ CLARENCE C. SLATER, a pioneer in the electrical service industry in Columbus, Ohio, and formerly president and general manager of the Columbus Railway, Power & Light Company, died September 20 in Nelsonville, Ohio. Born in Nelsonville, Mr. Slater went to Columbus in 1901 as superintendent of the old Public Service Company and later became a consultant engineer and head of an electrical supply company. Then affiliating himself with the Columbus utility, he became president and general manager and served until his resignation in 1929.

▶ W. L. PERCEY, retired veteran officer of the Southern California Edison Company, died September 21 at his home in Pasadena, Calif., following a prolonged heart illness. Mr. Percey, who was a vice-president of the Edison company at the time of his retirement from active service in 1934, became identified with the electrical industry in southern California in 1896. In July of that year he joined the West Side Lighting Company, predecessor of the Southern California Edison Company, as treasurer. Throughout the development of the electrical industry in the Los Angeles area Mr. Percey held numerous important official positions with the companies which later became a part of the Edison company organization. With the incorporation of the Southern California Edison Company, he was named treasurer of the concern, and became a vice-president in 1925.

Mr. Percey was born in Hoosic, N. Y., in 1865. He went to California in 1896 on a visit, but remained to become one of southern California's outstanding electric utility officers.



BETTER THAN DAYLIGHT

Banish "End-of-Shift Fag" with this Restful Light

Workers feel no let-down at the end of their shifts when they enjoy the restful rays of Cooper-Hewitt Mercury Vapor Light. Details stand out so boldly that they appear to be magnified, yet the light is so free from glare that a workman could look directly into it—then stoop to pick up a pin on the floor. Workers' eyestrain and the resulting loss to management are practically banished.

Small wonder that light has become the most important of all modern production tools. It is the one item that directly controls the relative effectiveness of every other tool in the shop. It is a factor in the cost equation which has often been responsible for worthwhile profits.

The best way to prove to your own satisfaction the many advantages which leaders in every branch of industry enjoy under Cooper-Hewitt Light is to try it. For complete information write to the General Electric Vapor Lamp Company, 805 Adams Street, Hoboken, New Jersey.

GENERAL ELECTRIC VAPOR LAMP COMPANY

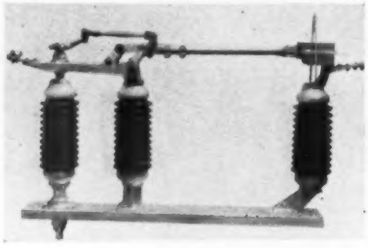
683-C

COOPER-HEWITT MERCURY VAPOR LIGHT

New EQUIPMENT AVAILABLE

Disconnecting Switch

Post insulators used on this disconnecting switch, which mounts in an upright, vertical or inverted position, are said to have cantilever strengths of 2,000 lb., torsional strengths of 12,000 in.lb. Self-aligning con-



Type "MB-139", 34.5-kv., 600-amp. disconnecting switch; equipped with Lapp "Station Post" insulators. **Delta-Star Electric Co.**, Chicago, Ill.

tacts are medium-pressure type, wiping clean with each operation, yet are closed when switch is open, to prevent the entrance of dirt, dust or soot. Large-area contacts are said to give effective heat dissipation under short-circuit conditions.

•

Induction Motors

This new line of riveted-frame, squirrel-cage, polyphase induction motors, available in a variety of electrical and mechanical modifications, incorporates improvements in stator-coil insulation, frame con-

Open, horizontal, sleeve-bearing, general-purpose, squirrel-cage induction motor, typical of types K, KF, KG, KR; available in ratings up to 75 hp. and 1,800 r.p.m., for 220, 440, 550 or 2,200 volts, two- or three-phase, all standard frequencies. **General Electric Co.**, Schenectady, N. Y.

struction and other design features. It is claimed that the recently developed insulating materials and processes employed for these motors eliminate the need for taping the end windings and produce an insulation assembly with high resistance to moisture and other harmful influences, such as mild acids, alkalis, oil and abrasion.

•

Nut-Retaining Connector

Split bolt connector with nut-retaining feature; in eight sizes for wires from No. 8 to No. 4/0. **Line Material Co.**, Milwaukee, Wis.

Contact pad and nut cannot drop off a recently announced wire connector, it is claimed. The retainer holds them out of the way while wires are inserted in the split bolt. When the nut is tightened the retainer is pushed flat against the connector end and does not swing about to make radio interference. Retainer is easily removable from and restorable to the connector.

•

Live Line Tap Clamp

Applications of this tap clamp include connecting transformers to primary wires,

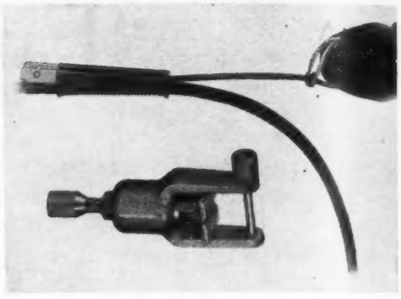
"Perma-Tap" clamps; maximum wire size, main line contact, No. 1/0 stranded copper or ACSR; jumper contact, No. 2 stranded copper or No. 3 ACSR; eye of screw and ring on clamp ¾ in. inside diameter. **Tips Tool Co., Inc.**, Taylorville, Ill.

branch line taps and lightning arrester installations. They are furnished for wire combinations of copper to copper, aluminum to copper and aluminum to aluminum and furnish a compression type connection for tap wires.

•

Service Cable Tool

It is claimed that service cable can be more conveniently installed and then cut to accurate length through the use of this new installing tool. The tool holds the



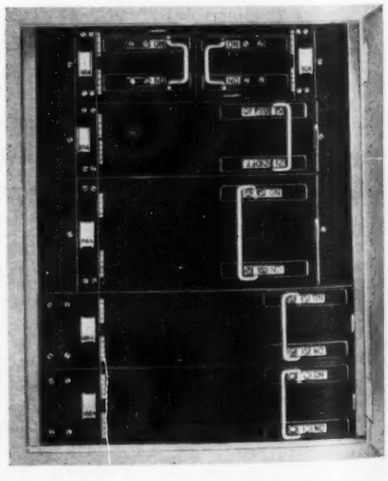
Service cable installing tool developed for use with any size Reliable concentric cable clamp. **Reliable Electric Co.**, Chicago, Ill.

cable on the wedge of the concentric cable clamp while the lineman pulls up slack and gives the final sag to the cable span. Shell of the clamp is then slipped on and tightened, tool removed and the cable cut.

•

Distribution Panelboards

Designed for heavy-duty feeder and power distribution applications where continuous production is essential, these panelboards, consisting of a number of individually inclosed sections, are separate dead-front circuits. When the doors of the units are opened the handle may be swung



"Swing-Wa" panelboards; available in five styles, for two and three poles, 250 and 600 volts, 50 to 400 amp. **Trumbull Manufacturing Co.**, Plainville, Conn.

to the "on" or "off" position by means of a sliding mechanism. It is said that no live parts are accessible when the doors are opened for this operation. "U"-shaped, double-break, self-aligning switching contacts have been designed to provide a low wattage loss and pressure contact.

Where IGNORANCE *means* MISS...

YOU MISS MANY A SALE BY SAYING, "I DON'T KNOW." DO YOUR SALESMEN KNOW ALL THE ANSWERS ABOUT MONEL METAL?

HOW many of these fine ranges are on your floor right now? Some of them—perhaps all. And you have other famous makes, topped with that lustrous-as-silver but tougher-than-steel Nickel alloy, Monel Metal.

Give your Monel-topped ranges the spotlight on your floor . . . they'll pay their way, and more. But—get your salesmen all set to answer your customers' questions about Monel Metal.

We have all ready to send you, your FREE copies of "Questions and Answers" on Monel Metal. Women the country over are interested in Monel Metal. Big space national advertising has seen to that. And when they ask your salesmen questions about it, it just doesn't do to fumble for an answer.

Two kinds of questions you get from prospects: "*What* does Monel Metal do?" and "*Why?*" Not so many of the first, for women know the answers. They *know* Monel cannot rust, cannot crack, chip, or peel. That it's solid, and that it grows ever more beautiful with use.

But Monel's abilities are so outstanding that it's natural they want to know "why." You increase their interest in Monel—and that means in your ranges, remember—by having the answers ready. You can even hand out some of these "Questions and Answers" cards to prospects.

Send in the coupon today for all you'll need . then group your Monel ranges together and watch 'em draw the crowds.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 WALL STREET NEW YORK, N. Y

Monel Metal is a registered trade-mark applied to an alloy containing approximately two-thirds Nickel and one-third copper. Monel Metal is mined, smelted, refined, rolled and marketed solely by International Nickel.

MONEL METAL

MONEL METAL
for
Household Work Surfaces
(Tables, Ranges, Sinks, etc.)

Questions and Answers:

Q. What is Monel Metal?
A. It is a solid metal—an alloy composed of ⅔ Nickel and ⅓ Copper.

Q. Where does it come from?
A. From mines in the Sudbury District of Canada. After the ore has been purified by a preliminary treatment in Canada, it is shipped to the Huntington plant in West Virginia where it is refined and rolled into sheets, rods, bars, tubing, etc.

Q. Is it a new metal?
A. No—it is 30 years old. It was put on the market in 1905, but was not used extensively in the home until about 1930.

Q. You say Monel Metal is 30 years old—where has it been used? I never heard of it until about 5 years ago, when your advertisements started to appear.
A. It was hidden away in industrial plants, where it is used for Acid Pickling Crates in steel mills; for Pump Shafts in pumping Acids such as Sulphuric Acid; for Mixing Vats in Dye Plants, Textile Mills, Soap Factories; in Salt Plants; for Motor Boat Shafts; for Work Tables and Sinks in Hotel Kitchens and Restaurants; for Vital Parts of Railroad Signal Equipment; for Steam Turbine Blades; in Commercial Laundry Machines; in other machinery. In fact, any place where a tough, strong, acid and alkali-resisting, beautiful metal is required. The industrial record of Monel Metal is proof of its superior qualities for household use.

Q. Does it rust?
A. No. Being composed of Nickel and Copper and containing only about 1% iron, it cannot rust.

Q. Does Monel Metal stain?
A. Not permanently. Fruit juices or milk, if left on it for long periods, may discolor it, but—the discoloration is easily removed with ordinary household cleansers like Bon Ami, Old Dutch Cleanser, Babo, etc.

...Monel Metal scratch? ...scouring perhaps, a diamond? But ...

THE INTERNATIONAL NICKEL CO., INC.,
67 Wall Street, New York, N. Y

Will you kindly send me.....copies of "Questions and Answers" on Monel Metal

Name.....*Firm*.....

Address.....*City*.....*State*.....

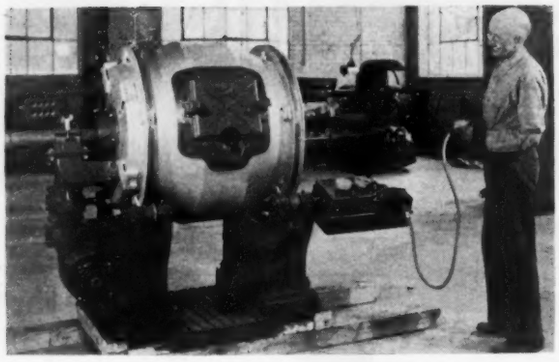
E Wd 10-10-36

"Imperial," by General Electric Co., with Monel Metal top and Inconel "Calrod" Heating Units.

The Westinghouse de luxe range "Emperor" with Monel Metal top.

"Mayfair," Electric Range by Hotpoint, with Monel Metal top and Inconel "Calrod" heating units.

Electric Furnace



Type LFC electric furnace, capacity 350 lb. **Detroit Electric Furnace Co.**, Detroit, Mich.

This indirect-arc electric furnace has been especially designed for the high temperature melting of copper, nickel, and alloy irons and steels. Equipment includes a recently developed automatic rocking control to increase the rocking angle to a maximum, remote control pouring switch, and magnetic brake motor on rocking mechanism. Arc at center of furnace is farther away from the refractory material than at the ends and the changed hearth design is said to permit easier tapping and cleaning. Hearth and refractory design are such that the metal is constantly brought back to the hottest part of the furnace.

Rural Live Line Tool Set

Designed for maintenance work on rural lines, this set of "hot-line" tools is said to provide for simplicity and ease in working on medium voltage, single- and three-phase lines to change out either a single insulator, crossarm or pole.

Rural live line tool set; picture shows control of one phase with two wire tongs and wire tong saddles, support of two phases with auxiliary crossarm and three wire holders; other equipment of set includes blade tie stick, insulated plier handles with 8-in. pliers. Complete set 8 ft 4½ in. over all. **Tips Tool Co., Inc.**, Taylorville, Ill.

Secondary Fuse Cutouts

These cutouts are for direct attachment to line wires by means of standard split bolt connectors. They are available in two styles: "Tension" type, which has a loop for connector attachment of transformer lead or other conductor, and "Service" type, which has no terminal at bottom end of arcing tube, from which the fuse link goes directly to load connection. This type is designed especially for sectionalizing secondaries.

"Tension" type secondary fuse cutout, "Service" type not shown; both styles made for 100-amp. fuses for use on voltages up to 600. **Line Material Co.**, Milwaukee, Wis.

ENGINEERING DATA FROM MANUFACTURERS

Bulletins and catalogs now available to engineers by manufacturers and associations

SPEED REDUCERS—Bulletin 22–10, issued by the Janette Manufacturing Company, 556–58 West Monroe Street, Chicago, Ill., describes its line of motorized speed reducers. Information is given on the horsepower ratings, speed reduction ratio, speed and torque of the 16 illustrated models.

INSULATING MATERIALS—Catalog No. 11 of William Brand & Company, 268 Fourth Avenue, New York, N. Y., lists the various types of electrical insulating materials produced by that organization. In addition to catalog data, the 18-page booklet contains interesting information on the histories and uses of various insulating materials.

PNEUMATIC TYPE CONTROLLERS—Pneumatic type controllers designed to control temperature, liquid level and pressure are discussed in Bulletin 444 of the Bristol Company, Waterbury, Conn. This 8-page bulletin describes and illustrates these controllers and their construction features and pictures various applications.

AIR CONDITIONING—A comprehensive discussion of air conditioning is contained in a file of material referred to as Application Data 67–000, Chapter 3, issued by Westinghouse Electric & Manufacturing Company, East Mansfield, Ohio. Information is given on the preparation of engineering estimates for air conditioning installations and heat transmission coefficients and tables. In addition to this technical discussion, air-conditioning equipment, including condensing units and evaporators, is pictured and described, with special reference to their specifications and performance. Bulletins SW–06–A and B describe a self-contained air-conditioning unit.

RURAL ELECTRIFICATION—"Wired Help for Farm and Home" is the subject of Bulletin 2071 of the Westinghouse Rural Electrification Department, East Pittsburgh, Pa. Suggested wiring diagrams for a farm home and buildings, with more detailed information on equipment for the separate rooms and buildings, are furnished in the well-illustrated 16-page bulletin.

WELDED PIPING—This booklet illustrates the application of arc welding to all kinds of piping. Photographs of welded pipe jobs for high- and low-pressure steam, water and gas, and statements of welding advantages, ease of insulation and installation make up this publication of the Lincoln Electric Company, Cleveland, Ohio.

GRAPHIC RECORDING — Samples of wax charts for both disk and roll recorders are included in a folder prepared by the Stylograph Corporation, Coldwater, N.Y. Specifications of these two types of charts and a discussion of the advantages of these charts is contained in the bulletin.

VOLTAGE REGULATORS—Rocking contact voltage regulators for small a.c. generators are described in Leaflet 2230, issued by the Allis-Chalmers Company, Milwaukee, Wis. Wiring diagrams and discussion of operation are included in the illustrated 4-page bulletin.

SWITCHES AND ALLIED EQUIPMENT—The recently-issued Bull Dog Current Catalog, published by the Bull Dog Electric Products Company, Detroit, Mich., gives complete information on this line of controlling and distributing apparatus for electric light and power. Catalog data and features of construction are contained in the 80-page booklet.

SHADED POLE INDUCTION MOTORS are discussed in Bulletin 1M35 of the F. A. Smith Manufacturing Company, Inc., Rochester, N.Y. Dimensions, general descriptive data and performance characteristics are given for the pictured line.

ELECTRIC CONTROLS—Line voltage direct controls for regulating temperature, limit and combustion are described in bulletin No. 120 of the United Electric Controls Company, 69 A Street, Boston, Mass. Instruction sheets on the various devices include information on their function, installation, operation adjustment.

ROLLER CHAIN DRIVES—Link-Belt Company of Indianapolis, Ind., has recently issued a 24-page book, No. 1557, in which are tabulated the many cut-tooth sprocket wheels now available with Silverlink finished-steel roller chains. This book contains information and ordering data to simplify the ordering of a wheel, a piece of chain or a complete drive.

DISTRIBUTION TRANSFORMERS—Distribution transformers, of various sizes, and of pole, platform, subway and vault types, are discussed in Catalog 116 of the American Transformer Company, 178 Emmet Street, Newark, N. J. Construction details and processes are pictured and discussed and catalog data and outline drawings are furnished for this line.

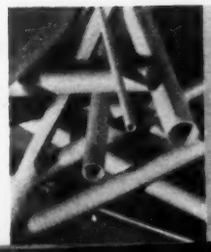
METAL-CLAD SWITCHGEAR — Bulletin G.E.A.-1661-A of the General Electric Company devotes 12 pages to a discussion of Type MI-6 metal-clad switchgear. Several pages are devoted to detailed dimension and connection diagrams with appropriate tabulated dimension data. Construction features are illustrated and described. Other recent G.E. bulletins also available are: G.E.A.-2331, on lightning protection equipment; G.E.A.-941-B, covering reciprocating air compressors, and G.E.A.-1540-A, dealing with automatic recloser, Type A-C-1.

THE SHOW GOES ON

Radio broadcasting stations, where an interruption is fatal, depend upon SYNTHANE laminated bakelite. While on the receiving end, radio sets in millions of homes function better, more dependably through its use. • SYNTHANE, the same dependable insulation that makes uninterrupted transmission and reception possible, can contribute the same reliability to your product.

SYNTHANE LAMINATED BAKELITE
SHEETS • RODS • TUBES
FABRICATED PARTS

Send for Sample Book



SYNTHANE
CORPORATION OAKS · PENNA

A NEW DAY DAWNS IN DRAFTING

For seven years, Bruning Drafting Machines have lifted a huge burden of time-wasting drudgery from draftsmen's shoulders. For seven years, they have proved that they save from 25% to 40% of drafting time. It is a simple fact that no other machines of their kind have approached them in efficiency and ease of use.

And now, again, Bruning heralds a new day in drafting with new models of its Standard and Civil Engineers' Drafting Machines.

These new Bruning Drafters are the finest, most perfected tools ever offered to draftsmen. They embody the widest range of exclusive advantages to be found in any drafting machines on the market. Yet they are simple in construction, and have the fewest working parts of any full-sized machine.

It is to your interest to know about the great forward stride that has been taken in drafting machines. So that you may have complete information, we have prepared an illustrated booklet describing the new Bruning Drafters. You are under no obligation in mailing the coupon for a copy.

BRUNING *SINCE 1897*

New York Chicago Los Angeles Boston Detroit Houston Kansas City Milwaukee Newark Pittsburgh St. Louis San Francisco

THE COUPON WILL BRING YOU THIS *FREE* ILLUSTRATED BOOK

CHARLES BRUNING CO., Inc., (721)
102 Reade St., New York, N. Y.

Please send me your FREE Booklet, "How to Take the Waste Out of Drafting."

Name .....

Company .....

City .....

State .....

—A nation-wide service in sensitized papers, reproduction processes, drawing material and drafting room equipment.

Economic Aspects of Grand Coulee

(Continued from page 41)

Army Engineers estimate annual charges of $11,143,000, of which only $152,000 is the variable item of operation and maintenance, the balance being interest, depreciation and maintenance. Only when 3,000,000,000 kw.-hr. are marketed can cost of power approximate the production cost of a steam plant.

Grand Coulee alone can produce 66 per cent more power than all of the existing plants in the three marketing areas. The U. S. Geological Survey shows total energy production for Oregon, Washington and Idaho in 1934 of 5,174,000,000 kw.-hr. Grand Coulee can exceed that total by 45 per cent. Its total capacity is in excess of the total water power capacity of California. These illustrations might be extended indefinitely, but enough has been said to show the hopelessness of the government's undertaking to make this plant self-liquidating.

Congress must stop such waste of tax money

Interest in these great undertakings is not limited to the Pacific Northwest. Every dollar that goes into construction goes into the national debt. The Army Engineers estimate interest during construction on the power plant of $22,328,709 and carrying charges of $33,296,676, or $55,600,000 in round figures. Annual interest charges to total production cost amount to $8,179,000. "Cheap power" which the President talks about will not be developed at this plant for forty or fifty years *unless the item of interest is omitted from the calculation of cost. And that must not be.*

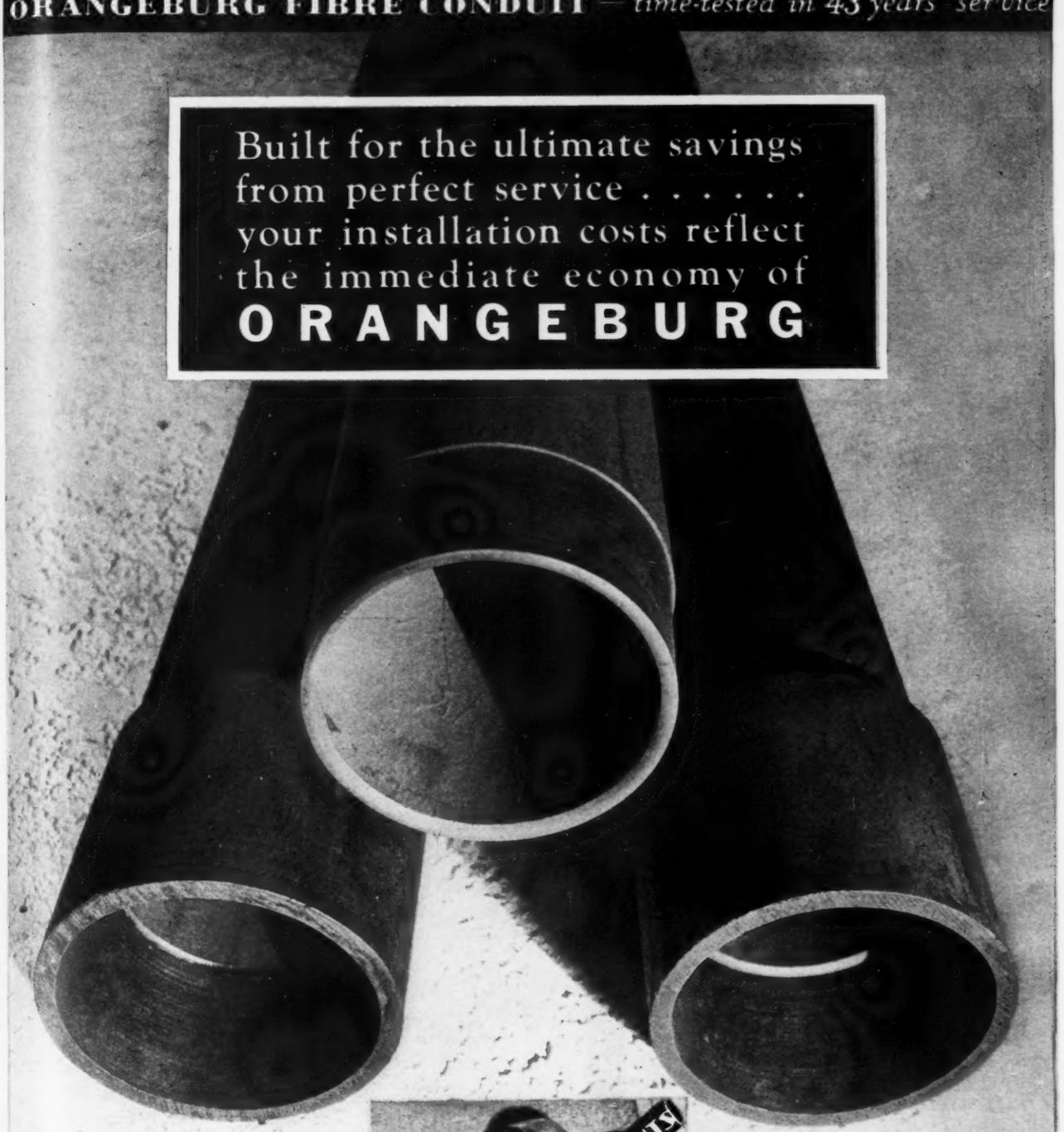
Building by the federal government of these and other great power projects constitutes a complete reversal of the policy that has prevailed from the beginning of our history. The Board of Engineers for Rivers and Harbors said, on February 23, 1932 (page 11, House Doc. 103):

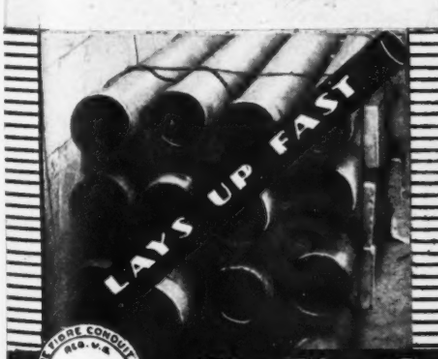
> The board is not prepared to recommend development on such a basis. (Construction at the expense of the government.) It does not understand that the action of Congress in the Boulder Canyon case was intended to be considered a precedent in the establishment of a policy for the development of water power by the federal government on its navigable rivers. On the contrary, it believes that the policy set forth in the Federal Water Power Act is the adopted policy for such development. . . . It submitted a comprehensive project for the development of the river and recommended

ORANGEBURG FIBRE CONDUIT — *time-tested in 43 years' service*

Built for the ultimate savings from perfect service . . . . . your installation costs reflect the immediate economy of

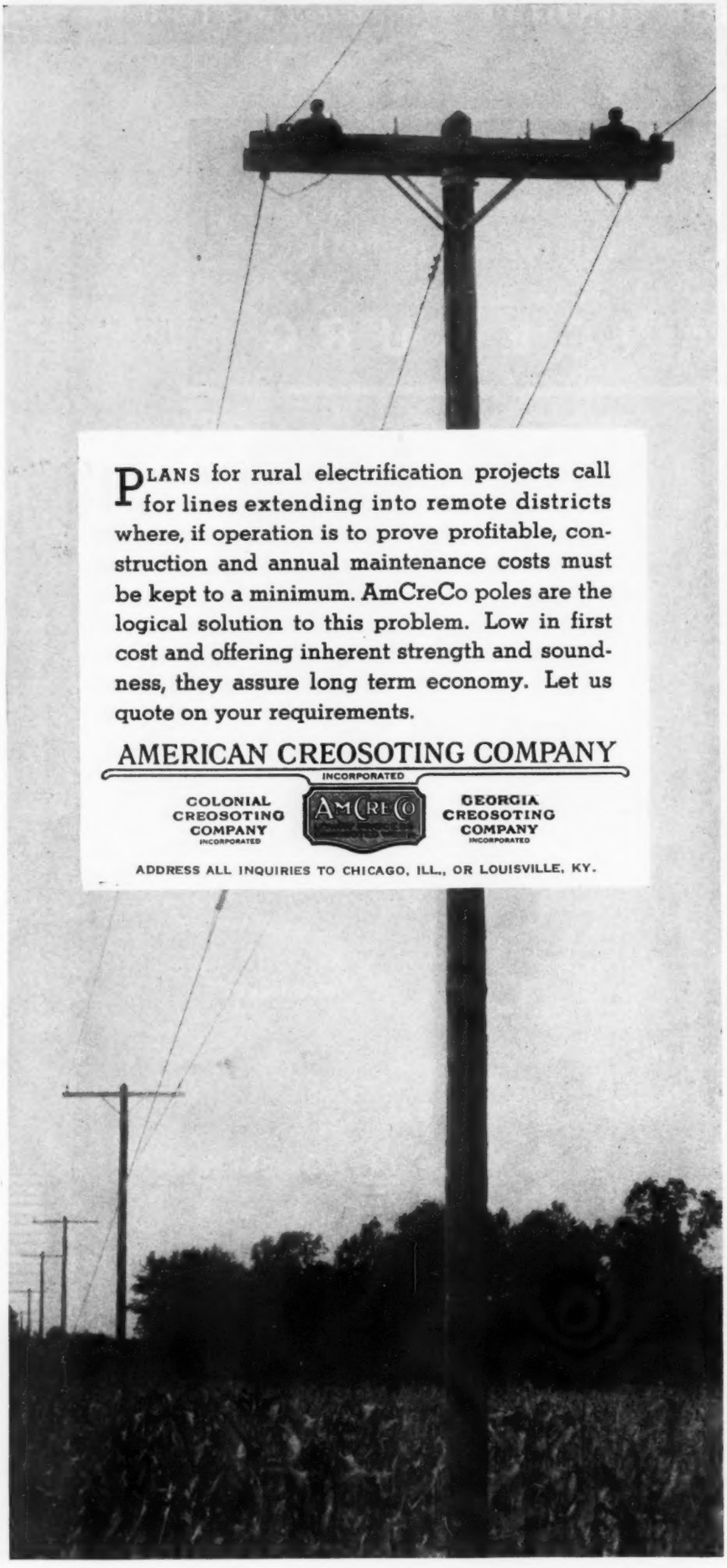
ORANGEBURG





The Fibre Conduit Company • ORANGEBURG, N. Y.

SALES AGENTS: **GRAYBAR ELECTRIC COMPANY** • **GENERAL ELECTRIC SUPPLY CORPORATION**


PLANS for rural electrification projects call for lines extending into remote districts where, if operation is to prove profitable, construction and annual maintenance costs must be kept to a minimum. AmCreCo poles are the logical solution to this problem. Low in first cost and offering inherent strength and soundness, they assure long term economy. Let us quote on your requirements.
AMERICAN CREOSOTING COMPANY
INCORPORATED
COLONIAL CREOSOTING COMPANY INCORPORATED
AMCRECO
GEORGIA CREOSOTING COMPANY INCORPORATED
ADDRESS ALL INQUIRIES TO CHICAGO, ILL., OR LOUISVILLE, KY.

in substance that the power be developed . . . by private interests, states or municipalities. There does not appear to be any insuperable difficulty in the development of the Columbia River power on the same basis at any time when it can be demonstrated beyond question that the value of the power is such as to justify its development on a purely business basis.

The authorization of these great projects by bureaucratic authority (P.W.A.) and the subsequent adoption of some of them by inclusion in the River and Harbor bills places the duty squarely on Congress of establishing a truly national policy. Muscle Shoals has been a "white elephant" for nearly two decades. We now have several such.

Are we to charge half the cost of Bonneville dam to navigation in order to figure cheaper power rates, in the face of the definite recommendation of high army officials and boards that navigation only justifies the cost of the locks?

Are we to subsidize irrigation at the expense of power at Grand Coulee in spite of the definite opposition of the Secretary of Agriculture to the irrigation scheme as unjustified, and as a direct and positive injury to the farmers of the country?

Are we to see the government go into the retail power business or will power generated at these plants be sold wholesale to power companies, municipalities and to industry?

These and many other matters must be settled by the Congress and not by administrative decree or bureaucratic whim. They should be settled as absolutely non-partisan and non-political matters. The Congress should have the best advice of the most highly qualified and experienced electrical and hydraulic engineers and executives of the power industry, both publicly and privately owned, and not of inexperienced theorists, or prejudiced advocates.

This is one of the major tasks of the new Congress.

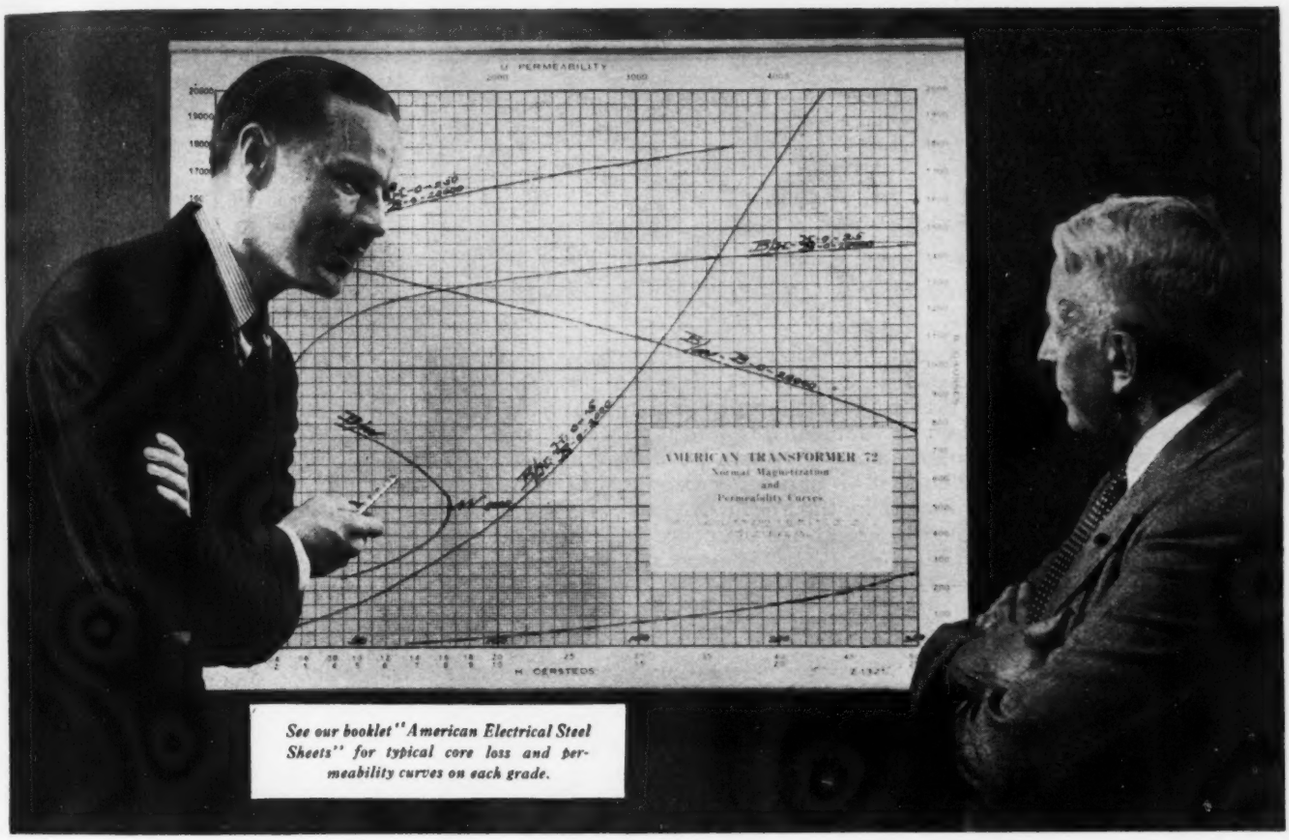
•

Thomson-Gibb Reopens Bay City Plant

The Thomson-Gibb Electric Welding Company, Lynn, Mass., is reopening its Bay City, Mich., plant to handle commercial welding under the name "Welded Products Division" of the parent organization. About 50,000 sq.ft. will be devoted to this work, and H. B. Warren has been appointed vice-president in charge.

AMERICAN ELECTRICAL SHEETS

are specially designed for their particular jobs



See our booklet "American Electrical Steel Sheets" for typical core loss and permeability curves on each grade.

WITH manufacturing cost and electrical efficiency so directly affected by the proper choice of core material, your equipment is not as good as it might be unless you are using electrical sheets specially designed for each specific use.

Since the optimum combination of properties (flatness, ease of punching, permeability, core loss, aging, and cost) varies for different equipment, we offer you American Electrical Sheets in a variety of grades and types—each specifically designed to make a better core at minimum cost in its recommended application.

Don't overlook this opportunity to reduce manufacturing costs, and to improve electrical characteristics. Use American Electrical Sheets which are flatter, more uniform, easier to punch . . . which have higher permeability, uniformly low core losses.

American Electrical Sheets are made in a variety of grades in these types:

AMERICAN TRANSFORMER 60-66-72
AMERICAN RADIO TRANSFORMER 72
AMERICAN DYNAMO · AMERICAN MOTOR · AMERICAN U. S. ELECTRICAL
AMERICAN ARMATURE · AMERICAN FIELD · AMERICAN POLE

Our booklet "American Electrical Steel Sheets" contains magnetization, permeability, and core loss curves. Write today for your copy.

AMERICAN ELECTRICAL SHEETS

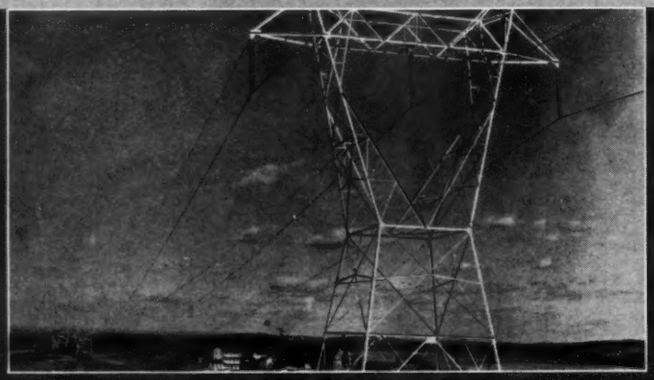
CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

United States Steel Products Company, New York *Export Distributors*

UNITED STATES STEEL

BLAW-KNOX PRODUCTS
for
PUBLIC UTILITIES

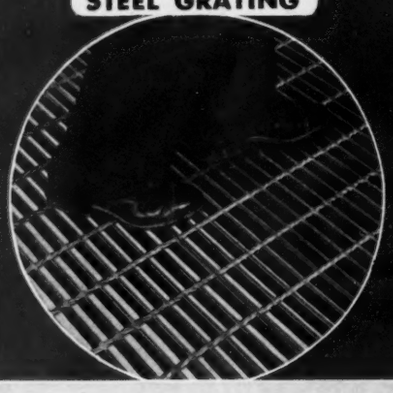


TRANSMISSION TOWERS

Thousands of miles of transmission towers . . . structural work necessitating highly specialized fabrication . . . enormous areas of Electroforged open flooring . . . standard steel buildings for all uses . . . gas cleaners for natural gas lines . . . steel forms for concrete tunnels, walls, etc. . . . steam purifiers, desuperheaters . . . clamshell buckets . . . and other products of Blaw-Knox manufacture are at work for the Public Utilities of America.

The fact that Blaw-Knox Products are in accord with the rigid standards of Public Utility purchasing is proof not only of the merit of the products themselves but of the house behind the products.

STEEL GRATING



GAS CLEANERS

STEEL BUILDINGS

CLAMSHELL BUCKETS

BLAW-KNOX COMPANY

2013 FARMERS BANK BUILDING, PITTSBURGH, PA.

Superposition Turbine Going Into Fisk Street

[*Continued from page 54*]

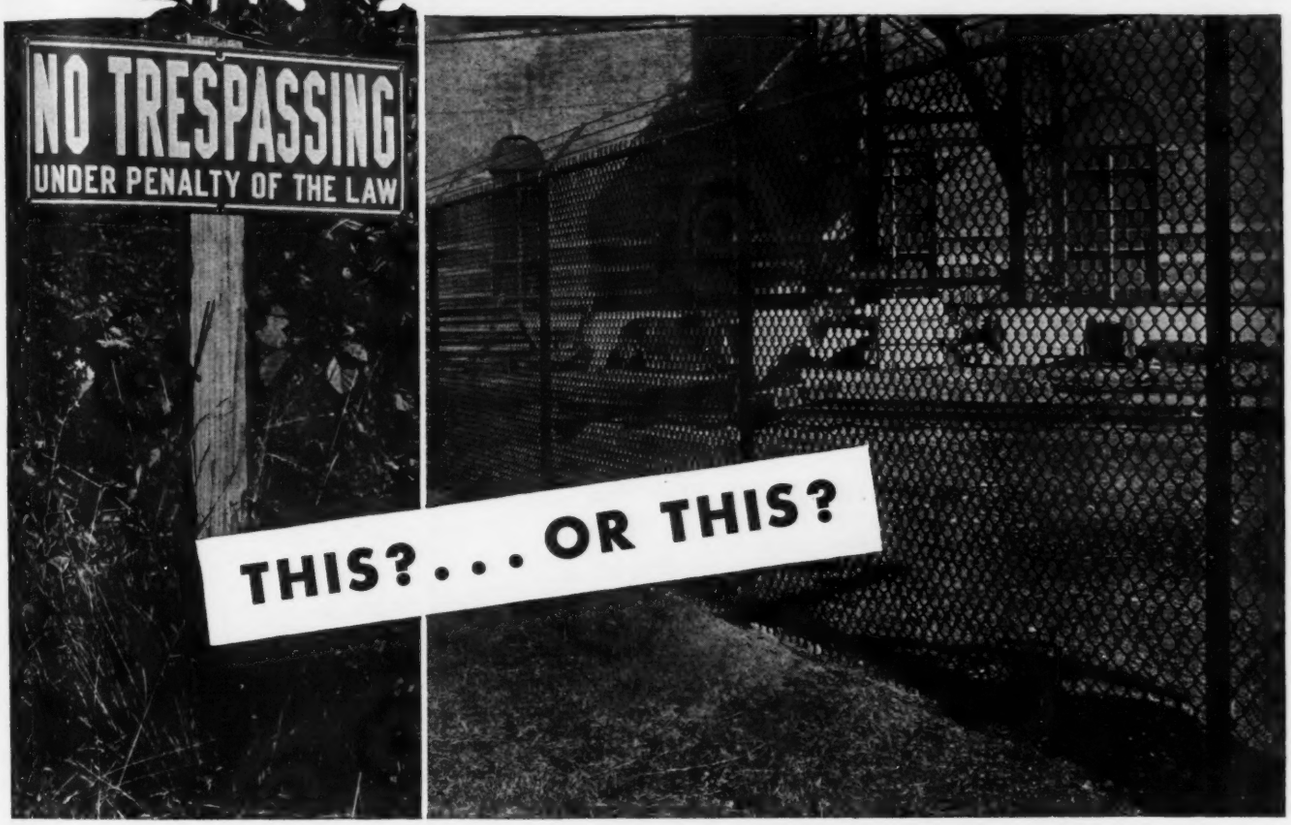
for normal operation at 720 r.p.m. and the other for maximum condition at 900 r.p.m. At maximum speed the fan will have a capacity of 212,000 cu.ft. of gases at a pressure equivalent to 15.2 in. of water. Between the air heater and the induced-draft fan will be provided a dust eliminator, which will take around 90 per cent of the dust out of the stack gas. Locating the collector on the fan suction provides for clean gases to the fan and materially reduces the maintenance on it.

The high-pressure steam and boiler feed piping will be of carbon-molybdenum steel tubing. Joints will be welded except at machinery outlets, where they have to be broken periodically for inspection and overhauling. Valves will be made with carbon-molybdenum bodies with stainless steel trim. The seat and disk faces will be Stellited. They will all be designed for 1,500 lb. pressure. We are planning on having header sections, those with a number of outlets, made up in the shop in longest lengths possible and welded in to the system on the job. This will save considerable field labor and reduce costs.

In order to improve the operation and the heat cycle it was found advisable to make some changes in the auxiliary equipment of units 11 and 12. The old hydraulic vacuum pumps and turbine-driven hot well pumps were replaced by efficient steam jet vacuum pumps and motor-driven hot well pumps. New evaporators and closed heaters were installed with extraction connections from two stages of each turbine. We were fortunate in being able to get an additional extraction point on unit 12 by inserting a ring inside of the turbine casing and taking the connection out through the turbine cylinder shell.

Connecting the new unit into the electrical system will require very little new work. Switch and bus positions are available in the existing structure. The greater part of the electrical work will be in supply of energy to auxiliaries. Although the new machine will go onto the 25-cycle system, it was felt that its auxiliaries should be on 60-cycle service. The installation of the new unit for operation with Nos. 11 and 12 furnished both an excellent occa-

Which do you DEPEND on for Protection?



SIGNS are worthless — they label your property as "easy pickin's." Board fences are expensive — need frequent painting—are easy to climb. Makeshifts last only a few years — encourage theft, detract from the appearance of your property.

But sturdy, unclimbable Cyclone Chain Link Fence is real *money-saving* protection. For Cyclone Fence is built to "stay put." It reduces insurance rates. It keeps your valuables in — keeps thieves out. And it increases the worth of your property by making it more attractive.

Cyclone Fence has many exclusive features that save its owners money. For example, the Cyclone Chain Link Fabric which bears the 12m label has an extra heavy coat of galvanizing that stands a minimum of 12 one minute immersions by the Preece Test. This means much longer life, less upkeep cost.

We will gladly send a representative to give you full information and estimates. There is no charge for this service. Write or wire us at Waukegan, Illinois, or phone our nearest branch office. Crews of trained men are ready to erect your fence at once. Valuable illustrated book free on request.

U·S·S CYCLONE FENCE

CYCLONE FENCE COMPANY

General Offices: Waukegan, Illinois · Branches in Principal Cities

Pacific Coast Division: Standard Fence Company, *General Offices:* Oakland, California

United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

RECENT POSTAL AND WESTERN UNION

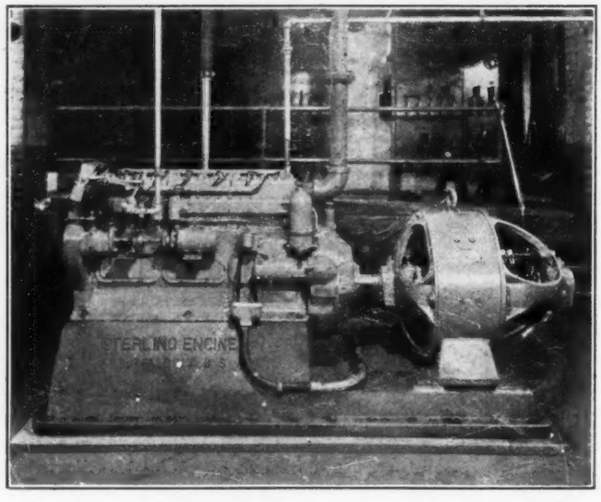
emergency generator sets were powered with

STERLING HIGH DUTY INTERNAL COMBUSTION ENGINES

The governing was described as the most accurate observed by the engineers. This business was awarded for Sterling engines on a quality and performance basis.

GAS—GASOLINE—DIESEL OIL ENGINES

SEE OUR EXHIBIT AT THE
TWELFTH NATIONAL EXPOSITION OF POWER & MECHANICAL ENGINEERING
GRAND CENTRAL PALACE, New York
November 30 to December 5, 1936



For power in emergency in the Finance Building, Philadelphia, Pa., the Postal Telegraph Co., employs a Sterling Petrel C-6 cylinder 115 H.P. engine direct connected to a 40 K.W. Westinghouse generator running 1200 R.P.M.

STERLING ENGINE COMPANY

Home Office and Plant
1270 Niagara Street
Buffalo, New York

Dept. C-2

Branch Office
900 Chrysler Bldg.,
New York, N. Y.

sion and an immediate reason for changing the auxiliaries of the latter two from 25 to 60 cycle supply. Since the electrical construction is still quite a way ahead in the future, it is not possible to present any details on it at the present time.

Lighting Service Pays

[*Continued from page 46*]

partment enlarged as a practical operation. For example, ten home-lighting jobs on an average give the same energy results as a range sale. But it takes between $2.50 and $3 for each one dollar of annual revenue from a range, whereas these home-lighting jobs are sold much more readily—the cost is about 82 cents per dollar of revenue. Considering the relatively high rate and increment rate for lighting as compared to cooking or water heating, there is no doubt that more lighting load is the more profitable business.

Undoubtedly heavy-duty appliances should be sold and will be sold, but the evidence is unmistakable that lighting sales should also be made in volume. This is profitable business. And home-lighting service is an indispensable agency to get increased lighting business. It is an activity that every utility should develop and expand according to the experience and the evidence found on the Philadelphia Electric Company system.

•

Canada Our Best Customer

July shipments of electrical goods to foreign countries amounted to $8,687,814, according to a preliminary statement by the Department of Commerce. Countries taking more than $250,000 worth were: Canada $1,199,372, Argentina $765,656, United Kingdom $761,968, Union of South Africa $751,774, Mexico $470,238, Brazil $370,273, U.S.S.R. (Soviet Russia) $359,596, France $321,354, Cuba $264,917.

Radio equipment led in value—about $2,048,000. Some of the other groups were: generators $352,000, transformers $133,000, batteries and cells, storage, dry and other, $465,000, insulated copper wire $184,000, control apparatus $247,000, motors $259,000. These goods went to 109 different countries.

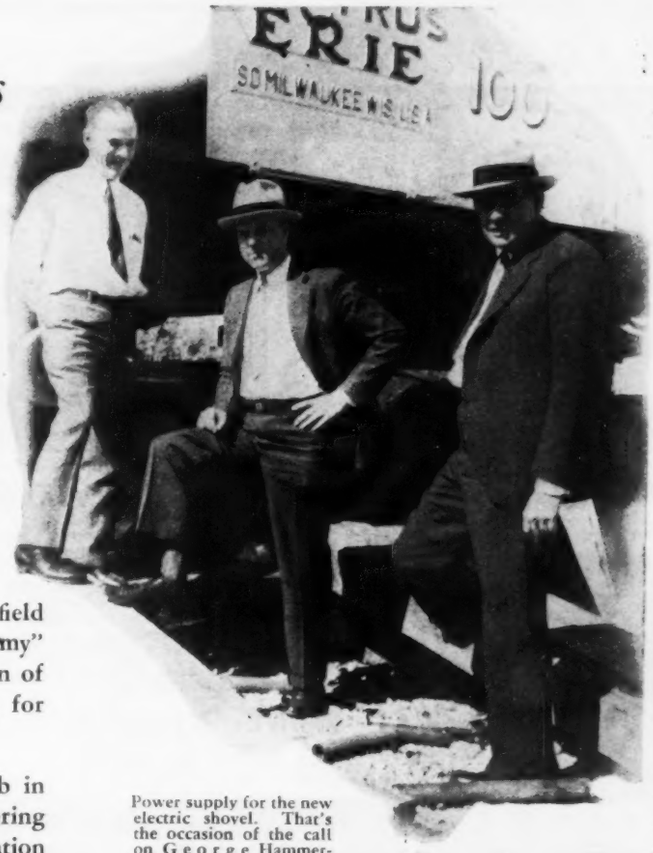
Spend a Day on Power Sales with

E. A. ARMSTRONG

Manager, Power Sales

Public Service Company of Northern Illinois

•



Power supply for the new electric shovel. That's the occasion of the call on George Hammerschmidt, one of the owner-operators of the Elmhurst Chicago Stone Company, by R. W. Noddins, Industrial Sales Manager, Western Division, Public Service Company of Northern Illinois, and Manager of Power Sales, E. A. Armstrong.

BECAUSE he spends so much time in the field on industrial power problems, "Army" Armstrong usually finds quite an accumulation of work when he arrives at the office. Here, for instance, is a typical day:

With the mail out of the way, no small job in itself, there's a consultation with the engineering department concerning a customer sub-station layout and the equipment necessary to provide adequate service.

Then comes a discussion with the Industrial Sales Managers of the three divisions and the Rate Department regarding an air conditioning rate to foster that business with E. A. Armstrong approaching the problem from the customers' viewpoint.

Now the conference telephone hook-up is waiting. A power sales engineer has suggested to a power customer a modern machine using compressed air to reduce the customers' production cost. This requires a new air compressor and special motor control. Engineering Department accepts the new line requirements and the Division Industrial Sales Manager and Armstrong decide to recommend the installation.

Time for lunch. "Anything special today, Miss Libera—Oh, yes, the Association of Commerce." So "Army" joins a group and walks over to the Palmer House to hear by radio the Burlington Zephyr make its millionth mile, after which Ralph Budd, C. F. Kettering, H. L. Hamilton and E. G. Budd tell about new things in prospect in high speed rail transportation.

Afternoon finds "E. A." in the field again. "Ought to see about the power supply for that new electric shovel at the quarry of the Elmhurst Chicago Stone Company. She'll be ready to start digging soon and we must be sure the quarry distribution system is all set to take the load."—and that's where we caught him with the camera discussing this important subject with George Hammerschmidt, and R. W. Noddins.

Reading Electrical World "my best source"

He calls himself our "youngest oldest" reader, having subscribed to ELECTRICAL WORLD before entering high school. "It is one of the most important sources of my education, particularly enabling me to keep in touch with developments and the availability of all types of electrical equipment."

Yes, Electrical World is a "best source" with thousands of engineers and executives in every branch of the electrical industry. That's one reason why advertisers in Electrical World find such a ready reception for their sales messages. May we give you more details? ELECTRICAL WORLD, McGRAW-HILL BLDG., NEW YORK.

Yesterday

FIRES TURNED CITY BLOCKS INTO BLACKENED RUINS

● This old Currier & Ives print gives a graphic picture of fire fighting about the middle of the last century.

LUX Fire Protection advertising will feature other examples of fire-fighting having historical interest.

Today

FIRE STRIKES ··· AND NOT A LIGHT GOES OUT

LUX Protection for a synchronous condenser installed in the plant of a large utility company.

■ For the LUX system swings into action at the first flash of heat—Fire is instantly smothered by a dry harmless gas —Uninterrupted Service goes on.

LUX was the first ***automatic*** fire protection ever devised or successfully installed for the protection of electrical equipment—yet its cost is lower than you think, being less than ½ of 1% of the cost of equipment it protects.

Let our engineering staff survey your requirements and submit concrete recommendations.

Walter Kidde & Company

Bloomfield, N. J.

MORE THAN 4,000,000 H. P. IS LUX PROTECTED

Harnessing Steel's Greatest Enemy—RUST!

The rust on your metal is actually **put to work** as a protective pigment when you paint with Rust-tox. The action of Rust-tox is as follows: (1) It penetrates into the pores of the metal. (2) It extracts all of the moisture-content of the rust, giving it the same qualities as the iron oxide used in metal paints. (3) It forms a semi-hard surface which does not check or peel as do ordinary paints.

Rust-tox saves you money in three ways. (1) It saves the expense of removing the rust. (2) It has approximately twice the square-foot coverage of ordinary paints. (3) It gives you a much longer-life paint job. These facts are proven by seven years performance.

Rust-tox is available in black, red, gray, green and aluminum. Color card, and prices on request.

RUST-TOX

CONQUEROR OF RUST

Product of THE SKYBRITE CO., Cleveland, Ohio

Recent Rate Changes

ILLINOIS POWER & LIGHT CORPORATION's electric rate reduction has been approved by the Illinois Commerce Commission. The cut applies to residential, commercial and large power users in the 262 cities and towns served by the company. Savings total $120,000 to patrons.

WISCONSIN POWER & LIGHT COMPANY has been authorized by the state Public Service Commission to reduce farm, store and office electric rates $169,000 annually. The new farm rate schedule will give customers 50 kw.-hr. monthly for a minimum of $4 with the next 25 kw.-hrs. at 6 cents each, the next 25 at 3 cents and all over 100 kw.-hr. at 2.5 cents. The utility will also make a $400 investment in rural extensions per customer provided he contracts for at least one year's service.

SUPERIOR WATER, LIGHT & POWER COMPANY has announced lower electric rates which will result in an approximate annual saving of $22,000 to commercial customers. It follows a similar change in residential rates made by the company May 1, estimated at an annual saving of $8,500.

KENTUCKY-WEST VIRGINIA POWER COMPANY has reduced its rates $140,168 annually under a new schedule of electric rates filed with the Kentucky Public Service Commission. The new rates represent a decrease of 9½ per cent over those existing for several months. The minimum bill will be $1 a month.

BIRMINGHAM ELECTRIC COMPANY has agreed to place owners of multiple property on the same basis as residential consumers. Apartment-hotel and multiple dwelling owners in Birmingham will be benefited to the extent of 10 per cent of their electricity bills according to the order issued by the Alabama Public Service Commission and agreed to by the utility. Under the ruling energy for buildings of this type will be charged half-price for energy in excess of the bill for the corresponding month in the year ending March 31, 1933.

SPRINGFIELD GAS & ELECTRIC COMPANY has proposed to reduced electric rates in that city $130,000 a year, and at the same time replaced the street cars with motor buses. The utility made its proposal to the Missouri Public Service Commission last month, agreeing to the rate reduction if permitted to absorb as much of the Springfield Traction Company's properties as could be used in a motor bus transportation system. The rest of the property, it suggested, should be liquidated.

ST. JOSEPH RAILWAY, LIGHT, HEAT & POWER COMPANY has been granted a rehearing by the Missouri Public Service Commission in a valuation case in which the commission last May fixed the fair value of all property of the company at $8,380,000 as of April 1, 1932. In the valuation order the company was directed also to reduce its rates by more than $300,000 annually.

CALIFORNIA-OREGON POWER COMPANY's rate reductions recently filed with the Oregon Public Utilities Commission will benefit approximately 4,000 consumers by $35,000 annually, Commissioner Frank C. McColloch has estimated.

ROCHESTER GAS & ELECTRIC CORPORATION's hearings before the New York Public Service Commission over capitalization and rate structure have been indefinitely adjourned.

SAN ANTONIO PUBLIC SERVICE COMPANY has been granted a twenty-year extension

PROFESSIONAL SERVICES

Consulting
Accounting
Valuations

Management
Appraisals
Construction

Designing
Testing
Financing

Inspections
Cost Analysis
Investigations

WILLIAM A. BAEHR ORGANIZATION, Inc.
ENGINEERS—ACCOUNTANTS—MANAGERS
231 South La Salle St.
CHICAGO

ELECTRICAL TESTING LABORATORIES
Electrical and Mechanical Laboratories
Tests of Electrical Machinery Apparatus and Supplies. Materials of Constructions, Coal, Paper, etc. Inspection of Material and Apparatus at Manufactories.
80th St. and East End Ave., New York

SANDERSON & PORTER
ENGINEERS
for the
FINANCING—REORGANIZATION—
DESIGN—CONSTRUCTION—
of
INDUSTRIAL and PUBLIC UTILITIES
Chicago New York San Francisco

BARKER & WHEELER
Utility and Industrial Valuations. Design and Construction of Power Systems, Water Supplies, Sewerage and Sewage Disposal, Factory Production and Cost Control Systems.
11 Park Place, New York City
36 State Street, Albany, N. Y.

FORD, BACON & DAVIS, Inc.
Engineers
DESIGN . CONSTRUCTION
VALUATIONS . REPORTS . INTANGIBLES
Philadelphia New York Chicago
Washington Dallas

SARGENT & LUNDY
Incorporated
ENGINEERS
140 South Dearborn St.
Chicago, Ill.

BLACK & VEATCH
Consulting Engineers
Water, Steam and Electric Power Investigations, Design, Supervision of Construction, Valuation, Tests and Laboratory Service.
Mutual Building, Kansas City, Mo.

FRANK F. FOWLE & CO.
Electrical and Mechanical
ENGINEERS
35 East Wacker Drive Chicago, Ill.

SPOONER & MERRILL, INC.
Consulting Engineers
Design—Supervision of Construction
Reports—Examinations—Valuations
20 North Wacker Drive, Chicago, Illinois

EDWARD J. CHENEY
ENGINEER
PUBLIC UTILITY PROBLEMS
61 Broadway New York

HOOSIER ENGINEERING COMPANY
Erecting Engineers
Transmission Lines, Substations
46 So. 5th St., Columbus, Ohio
431 So. Dearborn St., Chicago, Ill.
136 Liberty St., New York

STEVENS & WOOD
Incorporated
INVESTIGATIONS—REPORTS
APPRAISALS
30 Broad St. New York

HUGH L. COLEMAN
Specializing in Aerial Transmission Cable
Power Construction
Great Barrington, Mass.

CHARLES F. LACOMBE
WILLIAM S. LEFFLER
Engineers
Public Utility Administrative
Economic and Municipal Problems
Cost Analysis
Inducement Rate Development
Rate Cases—Appraisals
11 West 42nd Street, New York

JAMES WALKER
Consulting Engineer
Appraisals Railroads
Reports Public Utilities
Investigations Industries
105 West Adams St. Chicago

HUGH L. COOPER & CO.
General Hydraulic Engineering, including the design, financing, construction and management of hydro-electric power plants.
101 Park Ave. New York

LUCAS & LUICK
ENGINEERS
Power Plants Transmission Lines
Industrial Plants
Examinations Reports Valuations
Rate Cases
Public Utility Management
231 So. La Salle St., Chicago

THE J. G. WHITE ENGINEERING CORPORATION
Engineers—Constructors
Steam and Hydroelectric Power Plants, Transmission Systems, Office and Industrial Building, Air Conditioning, Railroads.
REPORTS and APPRAISALS
80 Broad Street New York

CARDS ON THIS PAGE
of Professional Services
are available at a cost that is negligible considering the possible clientele contacted. Rates on request to
Departmental Advertising Staff
ELECTRICAL WORLD, 330 W. 42d St., N.Y.

DANIEL W. MEAD
F. W. SCHEIDENHELM
Consulting Engineers
Hydro-Electric Development, Dams, Water Supply, Flood Control. Engineering Problems relating to Water Rights and Water Power Law. Appraisals.
New York City, 50 Church St.

Consulting Engineers can give needed advice regarding most any problem for they see each separate department in its relation to the whole plant—and they sell nothing but their broad experienced services.

for that speech . . .

get the material you need, from Hoffman's
THE PUBLIC SPEAKER'S SCRAPBOOK
Presents hundreds of selected beginnings, endings, provocative paragraphs, illustrations, anecdotes, etc., to build up your speech for any occasion. Also helpful hints on speaking. Send $2.50 for a copy on 10 days' approval.
McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York City

TOBE

BUILD LOAD

through locating

RADIO INTERFERENCE

HUNDREDS of utilities declare their satisfaction with TOBE Noise and Fault Locators. They actually BUILD load and here's how:—The average consumption of radio sets is 92 watts per hour . . . saturation 60% to 80% . . . interference any time—anywhere . . . 7 days a week. From these factors, figure your own losses due to interference.

Put those radios back on the line and you will be amazed at the increase in billings in a months' time.

TOBE service is being used by more than 500 utilities to recapture this load—to create proper relations with set users.

Although TOBE equipment is sold on approval, utilities never return a TOBE Noise and Fault Finder. This record—of which we are justly proud—will serve as assurance to you that you may WITH PROFIT test the instrument on your system.

TOBE DEUTSCHMANN
CORPORATION
CANTON, MASS.

TOBE

The coupon is for your convenience

CLIP and MAIL to

TOBE DEUTSCHMANN CORP.
Canton, Mass. 10-10
Please mail us booklet describing Noise and Fault Locator and details of your offer to utilities—
Name.....
Title.....
Company.....
City.....*State*.....

of its electric and gas franchise, which would have expired in 1940, under the terms of an ordinance finally passed by the city commission. In return for giving this extension, the city is to receive $100,000 cash from the company and the basic electric rate will be cut from 5.75 cents per kilowatt-hour to 5 cents. It is provided that the company must sign the agreement within the next sixty days and the new rates become effective immediately thereafter.

ORANGE & ROCKLAND ELECTRIC COMPANY has filed a revision of its power rate with the New York Public Service Commission which is estimated to save certain customers a total of approximately $2,000 annually.

COMMONWEALTH EDISON COMPANY has been ordered by the Illinois Commerce Commission to make a reduction of $30,000,000 annually in the cost of electricity to the people of Chicago. The commission also dismissed the application of the company to increase its rates by the amount of the 3 per cent tax. This cut, effective October 2, reduces electricity bills of over 900,000 Chicago consumers, including residences, offices, small stores and business houses. The saving to residential users of electricity will average 8 per cent, and including the savings in the 3 per cent tax will be 11 per cent. The action of the commission is in line with the policy laid down by Governor Horner at the inception of his administration that public utility rates in Illinois must be decreased wherever possible. Of the $3,000,000 total not less than $2,500,000 is to be applied to residential service and not less than $500,000 to commercial service. In commenting on the reduction James Simpson, Commonwealth chairman, said: "I am naturally disappointed at the commission's ruling which in effect reduces rates by $3,000,000 for the ensuing year, and requires the company to bear the Illinois utility tax of 3 per cent, amounting to $1,500,000 a year, without passing it along to our customers as other lines of business are allowed to do. The company's income is consequently cut below the point where if our 1935 volume, without commensurate increase were to prevail, our business would fail to earn a fair return on its property, as provided by law. . . . "

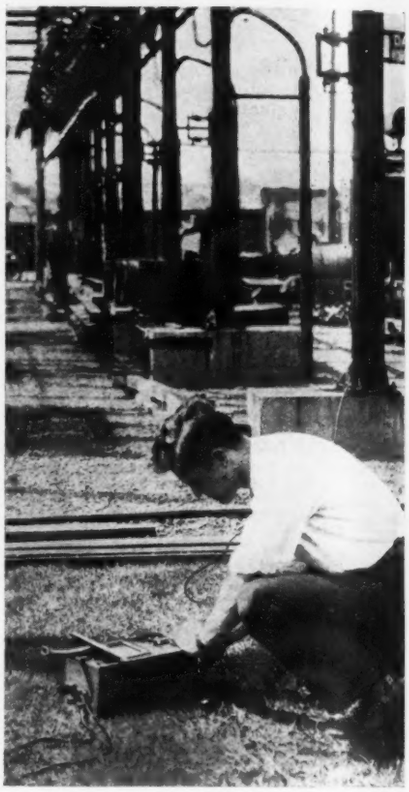
•

Illinois Gains 20 Per Cent

Sales of energy to ultimate consumers reported by twelve large companies in Illinois for August were 13.3 per cent greater than a year ago, the Commerce Commission of that state reports. Exclusive of the Commonwealth Edison Company, which gained 9.6 per cent, the increase was 19.8 per cent. Total sales were 545,830,835 kw.-hr.; sales of the eleven companies outside of Chicago were 227,717,155 kw.-hr.

The largest single increase, 107.3 per cent, was reported by Illinois Northern Utilities Co. Seven reported increases of 20 per cent or more. The Commission states that the increases were similar to those reported for the past several months.

"MEGGER"
GROUND TESTER



Your Protection
against
High Ground Resistance

IT is now so generally recognized that lightning arresters and other protective equipment require permanent and low resistance ground connections for their proper functioning, that one may well feel embarrassed when confronted with trouble traceable to high ground resistance.

The first and most important step for protection is to measure ground resistance *before* lightning strikes or other trouble occurs. To that end we should like to send you our literature on the "Megger" and "Meg" Ground Testers. These simple-to-use, accurate, rugged and ***direct-indicating*** instruments are performing an outstanding service in the electrical industry.

Write for descriptive Catalog 1425-W

JAMES G. BIDDLE CO.
ELECTRICAL INSTRUMENTS
1211-13 ARCH STREET PHILADELPHIA, PA.

Municipal Plants

LODI, CALIF.—Pacific Gas & Electric Company has made an offer to the city, which would forever enjoin the municipality from entering into the generation of hydro-electric power. Lodi owns and operates its own electrical distribution system. The power company offered to abolish all litigation over the construction of a municipally-owned power generating plant and to pay the city $75,000 in return for an agreement on the part of the city to withdraw plans to construct the plant. A legal controversy has existed since 1928 between the power company and the city over the municipality's plan to construct a generating plant on the Mokelumne River, east of Lodi. J. A. Henning, superintendent of utilities in Lodi, said the power company also offered Lloyd Thayer, owner of the site for the proposed dam and power plant $50,000 for his rights. The power company has an injunction suit in the superior court seeking to halt Lodi from proceeding with the sale of bonds and a suit in the United States courts attacking the constitutionality of a WPA grant to the city. The proposal asks the city to: (1) convey to Pacific Gas & Electric all rights, title and interests into real properties now held on the Mokelumne River in connection with said power project; (2) effectually and finally abandon said power project; (3) cancel and destroy all of said bonds which were authorized to be issued for constructing said project pursuant to election of September 12, 1935; (4) enter into a written stipulation with Pacific Gas & Electric consenting to a final judgment in the pending proceedings in the United States District Court, permanently enjoining the issuance, reissuance or sale of said bonds. City council declined to act on the offer immediately, but held the matter over for further consideration.

CALIFORNIA—By a decisive vote of 881 to 240 farmers in three districts near Bakersfield rejected the proposal of annexation of their territory to the South San Joaquin Municipal Utility District of the Central Valleys Water Project. The result of the election disclosed the second failure to the district to gain territory. Previous proposals have met with a similar fate, although a dissolution election held in the district proper failed to succeed. Every area involved in the voting in this election rejected the annexation proposal in an overwhelming vote.

SPRINGFIELD, ILL.—Voters will decide on October 20 whether or not the city shall purchase the electric and heating facilities of the Central Illinois Light Company, together with its office building for $7,200,000. The City Department of Water, Light and Power has been holding a series of meetings to which members of civic organizations and other groups have been invited to hear an explanation of the proposed purchase. Willis J. Spaulding, commissioner of public property, says there will be a yearly distribution cost saving through the merger of $250,000. There are 60 miles of duplication lines in the city. The referendum is the result of opposition to purchase on the part of the Peoples' Protective League (Electrical World, August 22, page 7).

HARRISBURG, ILL.—City Council has entered into a new five-year contract with the Central Illinois Public Service Company to furnish the city electric and water service at $5,000 per year. The contract contains an option for a five-year extension.

FOREST CITY, IOWA—In a municipal election held last month the city voted for a

DIXIE Poles
are
Long Leaf POLES

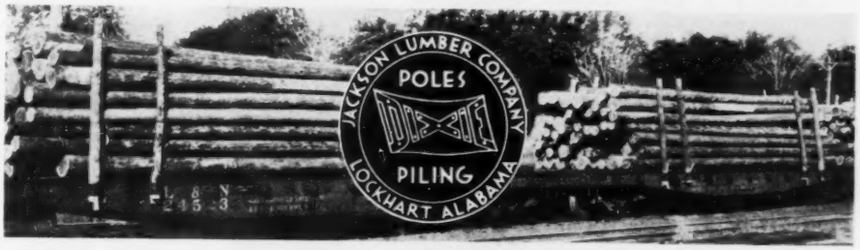
Cut from Dense Growth Long Leaf Yellow Pine, on our own lands, DIXIE Poles embody the extreme durability inherent in this particular species. ✦✦✦ With positive density at the heart, treatment penetration of sap wood is one hundred per cent.

Specify DIXIE Poles

Clean Bodied Stock — Notable Absence of Knots

Available at all treating plants: identified by the name DIXIE, branded on each pole, six feet above the ground line.

JACKSON LUMBER COMPANY
LOCKHART, ALABAMA — GEORGETOWN, S. C.
A CROSSETT WATZEK GATES INDUSTRY



LINCOLN Maximum Demand Meters

When the maintenance factor is considered in the total cost of demand meter installations, then Lincoln Meters are by far the most economical.

Thermo-Responsive Unit

TYPE WD
Watt Demand

Maintenance costs are low because only one unit moves — and that very slowly

LINCOLN METER COMPANY
SPRINGFIELD, ILLINOIS

Crapo GALVANIZED PRODUCTS

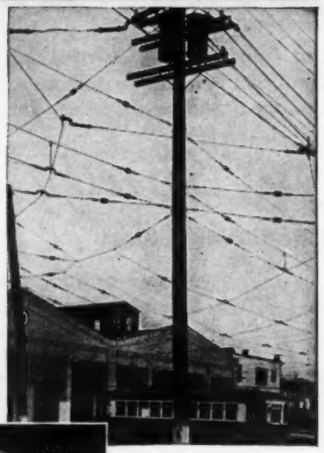
Proved in the Crucible of Actual Performance

Crapo Galvanized Steel Strand long ago demonstrated its ability to stand up under punishment in the most vulnerable spots.

That is why leading engineers now specify it exclusively for the toughest jobs. They know from actual service records that its *pure zinc* galvanized coating resists corrosion long after others fail; that it has a consequent longer life; and, that its use reduces maintenance costs.

Insist upon genuine *Crapo* Galvanized Steel Strand for all new and replacement work! It more than meets the most rigid specifications.

Indiana Steel & Wire Company
Muncie, - - Indiana



Steel Strand

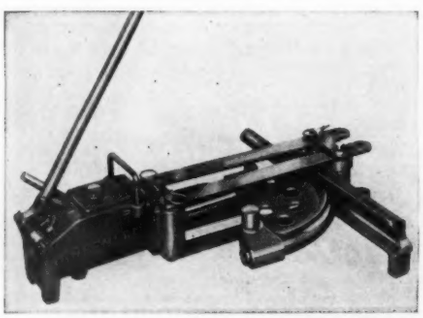
• • •

Telephone and Telegraph Wire

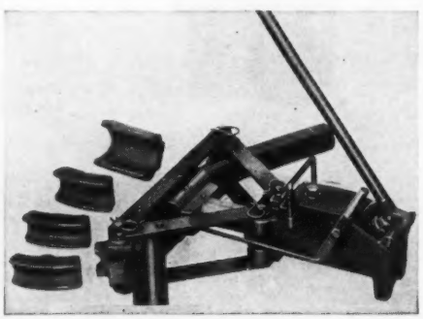
Crapo Galvanized Steel Strand "on the job" at Fairmont Car Barns of Monongohela West Penn Public Service Company.

Bend Conduit the GREENLEE Way
AND SAVE TIME AND MONEY

If you bend conduit and pipe by the usual methods in use before Greenlee Hydraulic Benders were put on the market, you are wasting time and money on every job. Not only do they bend faster and easier, but they do a better job. Note what two users have said in letters to us: "It paid for itself in the first ten days, and no better bends could be made, hot or cold." "Our experience proved to us that 3" conduit could be bent with the Greenlee Bender at approximately one-tenth the cost of any method we employed before."



Above is the Greenlee No. 770-T Bender for thin-wall steel conduit. Same as No. 770, but with different attachments. Bends quickly and easily, without crushing. Complete forward movement of the ram makes full 90-degree bend. Will handle 1¼, 1½ and 2-inch conduit.



Above is the Greenlee Hydraulic Bender for rigid conduit. It is simple to operate, easily portable, and makes bends quicker and better than by other methods. No. 770 bends all sizes from 1¼ to 3-inch. The large bender, No. 775, handles all sizes from 2½ to 4½-inch.

Write NOW for Complete Information

GREENLEE TOOL CO., 1705 Columbia Ave., ROCKFORD, ILL.

municipal light plant. The vote was 538 for to 437 against the plant. As yet no plans have been made to vote bonds for a plant. The Interstate Power Company's franchise expires next spring.

COLFAX, IOWA—Des Moines Electric Light Company was granted a 25 year franchise at a recent special election here, by a majority of more than three to one. The vote was 417 for and 132 against the franchise. The present franchise would have expired in June 1937.

LOUISA, KY.—City Council has decided to submit to the voters at the November election the question of building city-owned electric and water plants. Bonds for $92,000 will be issued for the electric plant and for $80,000 for the water works, if voters approve of the idea.

PARIS, KY.—City has filed a suit in the Bourbon Circuit Court seeking an injunction against the Kentucky Utilities Company to prevent it from engaging in "the sale or distribution of electric current for light, heat or power purposes within the corporate limits of the City of Paris without a franchise and against the consent of the board of commissioners." The petition also asked that the company be required to remove its electrical equipment from the public ways. The commissioners passed an ordinance in September forbidding the utilities company to distribute electric current after September 15 and directing that the carriers of electricity be removed from Paris streets. (Electrical World, September 26, page 94). The action was based on a 1936 act of the Kentucky General Assembly which says that "if a city owned or desired to own and operate a municipal plant to render the required service, it is not necessary for the municipality to offer a new franchise for sale to a private person, firm or corporation against the consent of the legislative authorities or governing board of that city.

NEWTON FALLS, OHIO—Adding to the many suits now pending against municipal power plant financing by P.W.A., the Ohio Public Service Company last week petitioned the Supreme Court of the District of Columbia for an injunction to restrain a proposed P.W.A. loan and grant of $91,000. Chief Justice Alfred A. Wheat granted the injunction. The Ohio Public Service Company asked for the injunction on the ground that its investment in Newton Falls would be jeopardized if the city proceeded with its plans.

SULPHUR SPRINGS, TEX.—Construction of a municipal electric light and power plant has been authorized by the people at a recent election. An issue of $240,000 of bonds, the proceeds to be used for building the plant and to purchase the distributing system of a private company that is now providing the city with service, was voted.

COWLITZ COUNTY, WASH.—On November 3 citizens will vote on the creation of a county-wide power district, involving appointment of three commissioners with authority to purchase and distribute power and light.

SUPERIOR, WIS.—Hearings on the application of the city to acquire the property of the Superior Water, Light & Power Company opened on September 21 before the state Public Service Commission. A list of objections dealing with the manner in which the acquisition referendum was passed and denying the jurisdiction of the commission was presented by counsel for the utility, but all were overruled by Commissioners A. R. McDonald and Fred Hunt, who presided. The price of $4,084,196 makes it the largest acquisition case ever to come before the commission.

ROME-CABLE
ROME, N.Y.

In one compact unit in Rome, N. Y., are the rolling, drawing and insulating mills and the executive offices of

ROME CABLE

Every department has as its head a carefully chosen superintendent experienced in his line.

In such surroundings every order from every customer finds capable hands to speed its progress.

We will be pleased to quote on your requirements for

HOT ROLLED COPPER RODS

BARE & TINNED COPPER WIRE
(In rounds, flats & squares)

BARE & TINNED STRAND

U.R.C. WEATHERPROOF WIRE

●

ROME CABLE CORPORATION
Mills and executive offices
330-400 Ridge Street
ROME, N. Y.

●

SALES OFFICES:
New York Chicago
Cleveland Pittsburgh Boston

SALES OPPORTUNITIES IN NEW CONSTRUCTION

FORT DODGE, IOWA—Fort Dodge Gas & Electric Company plans extensions in transmission lines in part of Webster County for rural electrification. Application has been made for permission.

BATTLE CREEK, MICH.—United Steel & Wire Company plans installation of motors and controls, conveyors and other equipment in two additions to wire and steel products manufacturing plant. Cost close to $150,000.

KNOXVILLE, TENN.—Director of Purchases, Tennessee Valley Authority, receives bids until October 16 for 1,680,000 feet of electric cable, with splicing materials and accessories for transmission line from Pickwick Landing Dam to Memphis, Tenn. Also, until October 20, for air-conditioning equipment for control building at Wheeler hydroelectric power plant.

DEARBORN, MICH.—Has completed surveys and estimates of cost for proposed city-owned electric power plant and system, totaling $3,400,000. City Council will make early decision, including necessary financing plan. Frederick R. Storrer is city engineer.

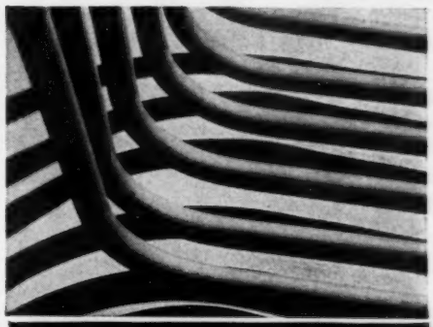
PALMYRA, MO.—Missouri Rural Electric Co-operative Association, recently organized, care of M. B. Messler, Palmyra, engineer, will take bids soon for transmission and distributing lines for rural electrification in part of Marion County, totaling about 325 miles, with power substation and service facilities. Initial work will comprise section of 150 miles, remainder to be built closely following. Power will be secured from municipal power plant at Hannibal, Mo. Cost about $350,000. Financing will be arranged through Federal aid.

SOLON, OHIO—Cleveland Electric Illuminating Company, Cleveland, has let contract to Sam W. Emerson Company, 1836 Euclid Avenue, Cleveland, for building to house new power substation at Solon, for which superstructure will begin soon.

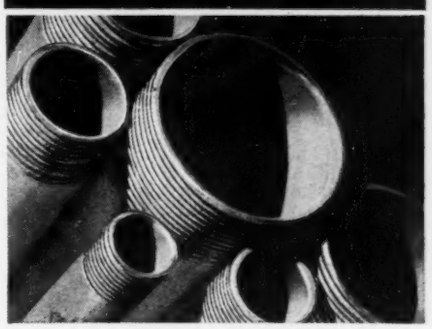
DENVER, COLO.—Bureau of Reclamation, Denver, receives bids until October 19 for transformers and other equipment for Boulder power plant, Boulder Canyon Project, Arizona-California-Nevada, as follows: Three 667-kva. single-phase, oil insulated, self-cooled 60-cycle, 33,000 to 480/2, 400-volt transformers; four 1667-kva. and three 1000-kva., 60-cycle, single-phase, oil insulated, water-cooled, 16,500 to 34,500-volt auto transformers; two 34,500-volt, three-phase, 60-cycle, 600-amp., oil circuit breakers; 12 34,500-volt, 600-amp., single pole, single throw outdoor type disconnecting switches; one 34,500-volt, 600-amp., triple pole, single throw gang-operated airbrake switch; six 34,500-volt, single throw gang-operated airbrake switches; six 34,500-volt, single phase distribution type lightning arresters; three 34,500-volt expulsion fuses; and two 16,500/115-volt indoor type insulated potential transformers (Specifications 839-D).

MALDEN, MASS.—Continental Can Company, 100 East Fortieth Street, New York, N. Y., plans installation of motors and controls, conveyors and other equipment in new three-story plant at Malden. Cost over $100,000.

DENTON, TEX.—Receives bids until October 15 for equipment for expansion in city-owned electric power plant, including Diesel-electric generating unit and accessories.



CHASE
RED BRASS
CONDUIT



CORROSION-RESISTANT
NON-MAGNETIC · ECONOMICAL

For conduit runs exposed to corrosive solutions or vapors or to strong magnetic fields, Chase Red Brass Conduit is ideally suited. It combines strength and workability with the essential properties of being corrosion-resistant and non-magnetic. The result is a long-life installation . . . economical and safe.

Chase Red Brass Conduit is available in Standard (I.P.S.) and "Thin-Wall" sizes.

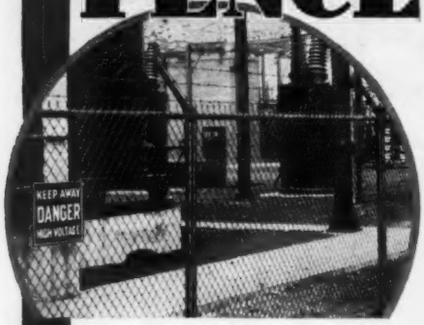
Free Handbook—
MAIL COUPON

Chase Brass & Copper Co., Incorporated*
Dept. E-5, Waterbury, Conn.
Please send me a copy of your publication on Chase Red Brass Conduit.

Name.....
Title.....*Company*.....
Address.....
City.....*State*.....

Subsidiary of Kennecott Copper Corporation

PAGE FENCE



America's first wire fence . . . still first!

The history of PAGE FENCE is one of constant improvement in fence construction, design and metals.

PAGE engineers recently designed the new wing channel Line Post with many advantages resulting—superior galvanizing, greater strength, a far neater, more serviceable installation.

PAGE has long recognized that no one metal is suitable for all fence conditions—has therefore pioneered in offering fence in a variety of superior metals—PAGE-ARMCO Ingot Iron, PAGE "ALCOA" Aluminum, PAGE Allegheny Stainless Steel, PAGE Copper-Bearing Steel, PAGE genuine Wrought Iron.

Located conveniently throughout the United States are 92 Page Fence Distributors who will gladly consult with you, without obligation, in best solving your fencing problem. They are prepared to recommend impartially the particular metal that will give you the best service, and to assume full responsibility for proper installation.

Write to any one of the offices shown below for helpful literature and name of the Page Fence expert nearest you.

PAGE FENCE ASSOCIATION
Bridgeport, Connecticut
NEW YORK PITTSBURGH ATLANTA CHICAGO SAN FRANCISCO

This Label—Your Guarantee

The PAGE P-12 label identifies PAGE galvanizing which is guaranteed to withstand a minimum of 12 one-minute dips by the Preece Test. PAGE P-12 galvanizing applies not only to fence fabric but also to posts, top rail and fittings as well—*your guarantee of maximum resistance to rust.*

America's first wire fence—since 1883

Cost close to $100,000. W. N. Harris is city engineer.

EUGENE, ORE.—Plans new transmission line from municipal power plant in McKenzie district to city limits, including power substation facilities. Cost about $70,000. Proposed to begin work early in 1937.

BATTLE CREEK, MICH.—Ralston Purina Company, McCamly Street, plans installation of motors and controls, regulators, conveyors, electric elevators and other equipment in six-story addition to local cereal mill. Cost about $700,000. Company headquarters are at 835 South Eighth Street, St. Louis, Mo.

FARMINGTON, MINN.—Dakota County Electric Co-operative Association, A. H. Gelder, Farmington, manager, will have plans drawn by Banister Engineering Company, 556 North Prior Avenue, St. Paul, Minn., consulting engineer, for proposed rural electrification system, recently referred to in these columns, and will ask bids soon through last noted office. Project will include about 185 miles in part of Dakota County, with service facilities. Cost about $200,000. A Diesel engine-generating station at or near Farmington, for power supply for system, is under consideration.

MEMPHIS, TENN.—Memphis Power & Light Company is considering transmission and distributing lines for rural electrification in part of Shelby County, including power substation and service facilities. Work will be carried out over a period of months. Cost estimated over $1,000,000.

TITUSVILLE, PA.—Cyclops Steel Company plans installation of motors and controls, conveyors, electric hoists and other equipment in new multi-unit addition to plant. Cost close to $100,000.

INDIANAPOLIS, IND.—International Harvester Company, Chicago, Ill., plans installation of motors and controls, conveyors, electric hoists, air compressors and other equipment in new factory unit, service and distributing plant on 2-acre tract of land on West Washington Street, Indianapolis, both for motor truck and farm machinery divisions. Cost close to $800,000.

COFFEYVILLE, KAN.—Will take bids soon for 5000-kw. turbo-generator unit and auxiliary equipment for extensions in municipal electric power plant. Entire project will cost about $200,000. Black & Veatch, 4706 Broadway, Kansas City, Mo., are consulting engineers.

BONNERS FERRY, IDAHO—Northern Idaho Rural Electrification Association, recently organized, H. E. Bassford, Bonners Ferry, president, plans transmission and distributing lines for rural electrification in parts of Boundary and Bonner Counties, including Naples and vicinity, about 100 miles, with power substation and service facilities. Fund of $119,000 has been secured through Federal aid.

DENVER, COLO.—Bureau of Reclamation, Denver, receives bids until October 19 for one 69,000-volt, three-phase lightning arrester; three 69,000-volt expulsion-type fuses; one 69,000-volt, three-pole, single-throw, gang-operated, air-break switch; and quantity of 2200-volt switching equipment, complete with circuit breakers and control apparatus, for Dead Ox pumping station, Owyhee Project, Oregon-Idaho (Specifications 840-D).

CORPUS CHRISTI, TEX.—Petrol Refining Company, 205 East Forty-second Street, New York, N. Y., plans installation of transformers and accessories, motors and controls, electric pumping machinery, conveyors and other equipment in new multi-unit oil refining plant at Corpus Christi, where tract of about 40 acres of land has been acquired. Cost about $1,000,000.

AVOID costly GUY WIRE REPLACEMENTS

Use non-rusting COPPERWELD

A major item of cost in line maintenance, unless the guys are Copperweld, is the expense of replacing rusted guy wires. This cost may not be segregated on the records but the money is spent, as most lines using ordinary guys require reguying during their life.

Each Copperweld guy installed on a new pole means a saving for your company throughout the life of that construction. Replacements are eliminated, thereby avoiding the cost of new strand and fittings, truck-time, labor and supervision.

You can profit by the high strength and non-rusting properties of Copperweld Guy Wire. It costs less than ordinary wire *per year of service.*

COPPERWELD STEEL COMPANY
GLASSPORT . . . . PA.